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In this issue



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frontispiece—

Public Health Service scientists collect water samples from a mosquito-breeding place and strain them through bolting cloth to concentrate microscopic organisms for studying food organisms of mosquito larvae.



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PHR

S Y N O P S E S

BROWN, WILLIAM J. (Public Health Service), SIMPSON, W. G., and PRICE, ELEANOR V.: Reevaluation of reactions to penicillin in venereal disease clinic patients. *Public Health Reports, Vol. 76, March 1961, pp. 189-198.*

Sixty-four health departments in 21 States, District of Columbia, and Puerto Rico and five border reception centers participated in a cooperative study of the incidence of reactions to penicillin among venereal disease patients.

Reactions were reported in 255, or 7.2 per 1,000 of 35,496 patients treated during a 3-month study period at each agency. The rate of reactions at the reception centers was 0.7 per 1,000; at the clinics, 9.7 per 1,000. Because the two groups were not comparable, the study was limited to the 25,550 clinic patients.

The principal reactions and the rate per 1,000 for each were urticaria, 5.7; moderate to severe anaphylaxis, 0.35; mild anaphylaxis, 0.70; and serum sickness, 0.43. No deaths occurred during the study period.

In general, the longer the planned schedule of treatment and the larger the amount of penicillin, the greater the number of reactions. No differences in

toxicity were observed between procaine penicillin G in oil with 2 percent aluminum monostearate and benzathine penicillin G.

The incidence of reactions was the same for patients who had penicillin previously with no reactions and for those receiving it for the first time. Among previous reactors, antihistamines appeared to reduce the risk. Negro patients tolerated penicillin better than white patients. The incidence of reactions increased with age.

A higher reaction rate in 1959 than in 1954, when a similar study was conducted, is believed to be the result of better observation of patients rather than increased sensitization.

No changes in present treatment practices in clinics are indicated. It is recommended that emergency supplies and equipment be kept in readiness and that patients be observed closely for immediate reactions following treatment.

SIDIO, A. D. (Allegheny County Health Department), HARTMAN, RICHARD T., and FUGAZZOTTO, PAUL: First domestic waste stabilization pond in Pennsylvania. *Public Health Reports, Vol. 76, March 1961, pp. 201-208.*

An experimental project in Allegheny County, Pa., a stabilization pond for treatment of domestic wastes, illustrates that the semiarid conditions of some western States are not necessary for the efficient operation of a lagoon. However, high evaporation rates undoubtedly increase the potential uses of this method of waste disposal.

Based on temporarily established load levels of 175 persons per acre of lagoon surface area, the following observations of the pond were recorded. The minimum biochemical oxygen demand reduction through the two cells was 87 percent. Algal growth rapidly reached a maximum level of 1 million cells per ml. Hydrogen sulfide gas levels have remained at an acceptable level except on two occasions, when odors could be detected

only in the immediate vicinity of the pond. The reduction of coliform organisms was more than 99 percent, and preliminary studies indicate a complete removal of *Salmonella* enteric pathogens.

Although maximum loading capacities have not been reached, the lagoon method has proved feasible in this area. It is especially suited where no regular sewer systems are available and where topographic and climatic conditions are appropriate. However, further experiments must be conducted to determine the maximum loading capacities of lagoons in this climate. Preliminary studies indicate enteric pathogens cannot survive in the full sequence of lagoon operation, but further detailed studies are needed to establish this conclusively.

HANSEN, CARL, L., Jr. (U.S. Air Force, Washington, D.C.), MICHAELSON, SOL M., and HOWLAND, JOE W.: Lethality of upper body exposure to X-radiation in beagles. *Public Health Reports, Vol. 75, March 1961, pp. 242-246.*

In experiments with beagles, lethality of exposure to ionizing radiation was significantly modified by shielding the lower part of the body. The LD-50/30 for upper body irradiation was 1,775 r; for

whole body irradiation it was 250 r. The gram-roentgen dose required to produce a median lethal dose is raised fourfold by shielding the lower portion of the body.

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Health Services for Government Employees

WALTER J. GERSTLE, M.D.

IF I WERE asked to write a television "spectacular" to dramatize the subject of health services for government employees, I would start with two pictures, each to be flashed on the screen ahead of the story.

In the first picture I would show a government office worker opening his desk drawer. Hidden in the drawer are a few half-used bottles of patent medicines, an aspirin bottle, and a plastic container of a prescription medicine. Next to them are a few band-aids, a half-full iodine bottle, and a bottle of eyewash. You would watch this employee take a pill out of the bottle and hand it to a fellow worker.

The second picture would take you into a well-equipped dispensary in a large government office building. A nurse is treating an employee who has a cut finger; another nurse is counseling a rather obese young stenographer; the medical secretary ushers a job applicant with a physical impairment from the waiting room to her desk, while another employee is leaving the physician's consultation room after a health maintenance examination. On the wall is the framed certificate of the Occupational Health Institute.

These two pictures delineate our subject: health services provided for government employees. A natural question arises at this point: Are we practicing what we preach? Now we have to ask which of the two pictures reflects our own situation.

Dr. Gerstle is medical director of the employee health service, Pennsylvania Department of Health, Harrisburg. The article is derived from remarks in a panel discussion at the American Conference of Governmental Industrial Hygienists at the Industrial Health Conference in Rochester, N.Y., April 26, 1960.

The fairest reply to the question is, "Not yet, but we try." In private industry, medical departments have for many years been an integral part of many companies with large employee populations; the picture is spottier regarding the small plants.

But in government, be it the Federal, State, or the city-county level of metropolitan centers, the concept of employee health services is an innovation which is only slowly making headway.

Before examining some of the problems which seem to hamper a rapid spread of employee health services over the Nation, you might find it of interest to take a bird's-eye view of the employee health service which I direct.

Pennsylvania Health Service

The Commonwealth of Pennsylvania has more than 73,000 persons on its payroll. Of these, about 12,000 are employed in the capital, Harrisburg. The State government functions through 32 departments, varying in number of employees from a few to many thousands. In 1947, following the heart attack of one of its members, the State legislature approved the establishment in the capitol of a first-aid room staffed by a nurse.

Some of the larger departments followed, each organizing a first-aid room staffed with one or two registered nurses who worked without medical supervision. Since the lack of such supervision materially limited the scope of their work, in the fall of 1957, four State agencies which together have about 7,000 of the 12,000 employees in Harrisburg agreed to set up an employee health service for their workers. This started in early 1958.

At present, the staff comprises a full-time medical director, a part-time psychiatrist, six registered nurses, and a part-time medical secretary. Four health units are maintained. The nonparticipating departments receive only emergency service because of staff limitations.

In the near future, however, this inequality of service will cease. The expansion of the employee health service to cover all State employees in Harrisburg has been approved. When it is completed, the staff will comprise 2 full-time physicians, 1 part-time psychiatrist, 12 registered nurses, 1 nurse supervisor, and 2 medical secretaries. The number of health units will increase to eight. An enlargement of the staff might be necessary in the future. Then all of the State employees in headquarters will receive the same treatment.

Once this expansion at Harrisburg is functioning properly, employee health services will be set up for the two other centers of heavy State employee populations, Philadelphia and Pittsburgh. There are at present nurses working without adequate medical direction in the State office buildings in these two cities.

The scope of our work does not differ materially from industrial medical departments of private industry. In the curative phase we treat occupational injuries and occupational diseases, providing emergency treatment for illnesses and accidents of employees and visitors, and treat minor health impairments for which ordinarily no medical care is sought from the family physician. We also treat an employee temporarily to enable him to finish his workshift until he can see his own physician.

In the preventive phase, health maintenance of our employees is encouraged. Periodic health examinations, special examinations in problem cases, mass inoculations, special health projects, health education and counseling, and protection against environmental hazards are the tools.

Staff limitations still curtail the full implementation of the program at the present. Pre-placement examinations are in the planning stage. Our employee population is unique in several aspects. Since the State has no compulsory retirement age, there are many aged employees who pose geriatric problems. We employ successfully several hundreds of physi-

cally impaired workers, epileptics, and discharged patients of mental institutions, a practice that sharpens our alertness for proper job placement.

A considerable number of our employees are daily commuters, making round trips of up to 180 miles. This influx of commuters is largely caused by unemployment in the coal regions of our State. Since these employees ride mostly in car pools of up to nine persons (in a station wagon), perplexing problems often result when one of them gets sick during the day and is too ill to carry on, but not sick enough to be hospitalized at Harrisburg. About one-third of the employees are on civil service rosters; the rest are patronage workers. This describes our service in a nutshell.

The Challenges

If we look across the Nation, we find relatively few adequate government health services. So far they are rather the exception than the rule. A critical look at the problems of the existing health services might explain why they are still a novelty. We might group our problems in (a) general categories also existing in other industrial medical departments and (b) those derived from the official character of our enterprises.

The most urgent of the general problems has to do with communications. People do not really know what industrial medicine is and what industrial physicians are doing.

This lack of knowledge is about as widespread among our fellow physicians as it is among lay people. Both groups have some strange notions about the scope of our work. We should try to define our place as supplementing the practicing physician but not replacing him. This education should start with our colleagues working in the field of public health, some of whom represent the executive management level of our organization, and then extend to the rest of the medical profession. I see an urgent need for a "Madison Avenue type" campaign by the organizations represented in the Industrial Health Conference.

In spite of the existence of the Council on Occupational Health of the American Medical Association, and the corresponding committees

of the State and county medical societies, the practicing physician often views the industrial physician as his enemy who will undermine his practice. We must do more advertising for occupational medicine. We are not the precursor of "government medicine." We do not pave the way for "socialized medicine."

We should tell more about the preventive phase of our work. We should stress that we actually increase the caseload for the practicing physician by our efforts in detection of early disease. We should emphasize that our work tends to foster better relations between the employee and his family physician.

We try to give better health maintenance to our employees. This increases the number of patients who will seek the remedy from the family physician for the ailments occupational physicians detect and diagnose. We can do the motivating to seek treatment, frequently in a much more forceful manner than anyone else.

To the employee, we represent, in a sense, management, with its power to continue or stop employment within established regulations. The asymptomatic disease in its very beginning does not make the employee see his family physician, but we are able to find it and successfully persuade him to seek treatment and cure. We supervise the most important 8 hours of the breadwinner's day, on which the successful completion of the other 16 hours depends.

Once the practicing physician realizes that the scope of our work in industrial medicine does not compete with his goals, any hostile attitude that he may have will give way to a better understanding of our specialty. We should not stop with the medical profession. Our educational campaign should extend to the general public. Once people learn that there is more to occupational medicine than dispensing aspirin and band-aids, the concept of health maintenance will be more universally accepted.

In this respect, such an effort will not only alleviate our own problems derived from being in a little-known specialty of medicine, but it will raise the health status of the population. We must speak for ourselves, however. No one else will.

What special problems are created by our position as government enterprises? In contrast with private industry, government is a nonprofit

organization and its operational funds are obtained from an elected tax raising and appropriating body. Government operations are, of course, in the public spotlight and are often exposed to pressure groups who sometimes work in the open as lobbies, sometimes more subtly. Health services for government employees are an especially inviting target. Activities which are completely within the approved scope of health maintenance and which are routinely done by private industrial medical departments are singled out by some physicians as competitive with private practice, and pressure is brought upon the government medical department to stop them.

This puts us on a spot. I feel we ought to have the courage of our convictions to do what we think is right, even if we might have to overcome our fear of stepping on somebody's toes. If we do not do this, we betray the trust placed in us by the taxpayers. We are charged by them to give health maintenance to our employees and to prevent occupational disease and occupational injury. If we fail to do so, the results are more lost man-hours, inefficient work by untrained replacements of workers, and lowered work efficiency caused by borderline health.

All this costs the taxpayers money; we all pay in one way or another in higher taxes. We are trying to persuade private industry to provide adequate medical service for its employees. But has not the time come that we should put forward a more forceful effort to do in our own yard first what we want our neighbors to do in theirs?

A government employee health service can be used for many pilot projects. It seems wiser to gain experience in our own organization before suggesting a certain project to private industry at large. If we have a model setup in government service, it can be used as a training center to help physicians and nurses of private industries organize their own medical departments.

Let us turn to another problem which becomes more apparent in governmental employee health services—the battle of the budget. We all know the slogan "Good health maintenance costs nothing, it pays." The publication, "Functions and Objectives," of the Occupational Health Institute of Chicago, gives the finding of the Ameri-

can Management Association that "the medical dollar produces more than any other dollar spent by industry."

The benefits of a medical program, however, are hard to measure in cost. In a government setup it is often harder than in private industry to obtain funds for equipment and for salaries adequate to attract highly qualified personnel. In that aspect private industry is a formidable competitor. Government operations, including the bidding system for filling State orders, are slow and its regulations unyielding. The expression "red tape" originates from government operations.

Funds come from more than one source, adding to administrative difficulties. It is very difficult to educate management that employee health services are concerned with living human beings and not with paper projects and that an administrative shortcut is sometimes vital.

This leads us to another problem, which we share, incidentally, with our colleagues in private industry: the position of the employee health services inside the organization. It is a direct staff service. The Occupational Health Institute, in its "Functions and Objectives," suggests that the "medical director . . . report to some responsible member of management who is familiar with the managerial interpretation of medical policy, and whose assistance can be relied upon in implementing that policy."

A close liaison with the personnel department seems imperative. The problems of the medical and the personnel departments often overlap. By close cooperation and mutual respect for each other's prerogatives, maximum benefits for the employees result. Another strong force which in private industry is often very useful for an improved health program, the labor union, is not very powerful in government services.

Let me touch briefly on another problem. Employees in a health department have as their superiors many administrators who are physicians. These medical men cannot always successfully resist the temptation to treat their own employees in a makeshift manner, even though

their offices lack the necessary equipment and the professional sample just received in their mail might be inferior to the medication a well-equipped dispensary might have available. Besides, the confidential nature of medical records should be preserved, even when the "boss" happens to be a physician.

So far I have stressed exclusively the external problems of employee health services, the relationship to the "outside world." A final word about an internal question. It is a mistaken belief that government employees are mostly desk workers. While desk workers constitute a great number, we should not overlook the many other occupations, the air pollution specialist, who has to climb smokestacks, the printing press operator, the gardener, or the radiation physicist. There are also machine operators and truckdrivers. All these varied occupations present a challenge to the medical knowledge of our personnel.

Adequate space, up-to-date equipment, and effective medication are prerequisites for a modern employee health service. Lay-advertised patent medicines should not be used. Continuous postgraduate training of the personnel is important. On all levels the expert knowledge of other health department divisions should help toward inservice training.

I have deliberately put the spotlight in my presentation on the problems facing health services for government employees. This should not be interpreted to mean there are no achievements and that no progress has been made. But I feel it is not well to present a glowing recitation of a chamber of commerce type report of local happenings which would have little practical value.

The sum of these statements points out that we have to make a choice. Do we want the working places of government employees to be nests of ill-advised self-treatment, or are we ready to equip them with the facilities of a modern occupational health center? If we make the right decision, we will be able to answer the question of whether or not we are practicing what we preach with a proud, "Yes, we are."

Reevaluation of Reactions to Penicillin in Venereal Disease Clinic Patients

WILLIAM J. BROWN, M.D., W. G. SIMPSON, M.D., and ELEANOR V. PRICE

MORE than a quarter of a million patients are treated with penicillin annually in venereal disease clinics throughout the United States. Although other antibiotics, such as the tetracyclines, erythromycin, and chloramphenicol, are therapeutically effective for both syphilis and gonorrhea, their comparatively higher price and lack of repository forms restrict their use to patients who are sensitive to penicillin. In the absence of an economically feasible and clinically practical substitute for penicillin in the routine treatment of venereal disease, reports of increases in the incidence of severe reactions or deaths attributable to penicillin are viewed with concern by health authorities responsible for the control of venereal disease.

Since penicillin therapy constitutes such a vital part of the control program, the Venereal Disease Branch of the Public Health Service has conducted two studies, one in 1954 (1,2) and the other in 1959 (3,4), to evaluate the incidence and severity of reactions to penicillin among venereal disease patients. The following report of the 1959 study includes a comparative analysis of the data collected in 1954.

Method of Study

Sixty-four health departments in 21 States, the District of Columbia, and Puerto Rico and 5 border reception centers participated in a cooperative study to determine the present inci-

All three authors are with the Venereal Disease Branch, Communicable Disease Center, Public Health Service, Atlanta, Ga. Dr. Brown is chief of the branch, Dr. Simpson is assistant chief, and Mrs. Price is a statistician.

dence of reactions to penicillin among patients treated for venereal disease (see p. 192). The participating clinics were requested to submit a study card for each patient treated with penicillin during a 3-month period. Since this 3-month period did not run concomitantly at all clinics, the actual collection of records extended from March 1959 through March 1960. On the card the reactions were classified into three broad categories—anaphylaxis, serum sickness, and urticaria, with a space provided for other reactions not falling into these three groups. A description of the reaction, which for the majority of patients was supplied as requested on the card, permitted a more uniform classification of reactions and a division of anaphylactoid reactions between "mild" and "moderate to severe."

The following instructions were given to the cooperating clinics:

Participants are requested (1) to detain patients in the clinic, if possible, for approximately 30 minutes following penicillin injection and (2) to instruct patients to report back to the clinic if they have any symptoms or complaints within 2 weeks following treatment. Although no special followup is being requested, if these two measures are followed, all immediate reactions and most severe delayed reactions will come to the attention of the clinician.

A Penicillin Reaction Study Card should be completed for each patient treated with penicillin, regardless of the diagnosis. Cards for patients on single-injection therapy may be mailed to the Venereal Disease Branch on the day of treatment or weekly, depending upon clinic volume. Cards for patients on multiple-injection schedules should be retained in the clinic until the planned schedule has been completed.

A second card should be submitted if a reaction is observed after the first card has been mailed. Complete the entire card and be sure to indicate on the last line that a card has been previously submitted.

The border reception centers supplied a monthly tabulation, by age and history of previous penicillin therapy, of all Mexican braceros treated during the month, completing a study card only for those experiencing reactions. This same procedure was followed by Dade County, Fla. All other participating clinics conducted the study as outlined.

Comparison of Clinics and Reception Centers

The incidence of reactions reported is shown by type in table 1. During the study period 35,496 patients were treated with penicillin, 25,550 in venereal disease clinics and 9,946 at the border reception centers. Reactions were reported in 255, or in 7.2 per 1,000 patients treated.

In venereal disease clinics the incidence was 9.7 per 1,000 patients treated. Urticaria was the most frequent type of reaction, occurring in 5.7 per 1,000. Anaphylaxis was observed in 27, or 1.1 per 1,000. However, in only 9 was it classified as moderate to severe. Serum sickness was reported in 11.

At the border reception centers the incidence

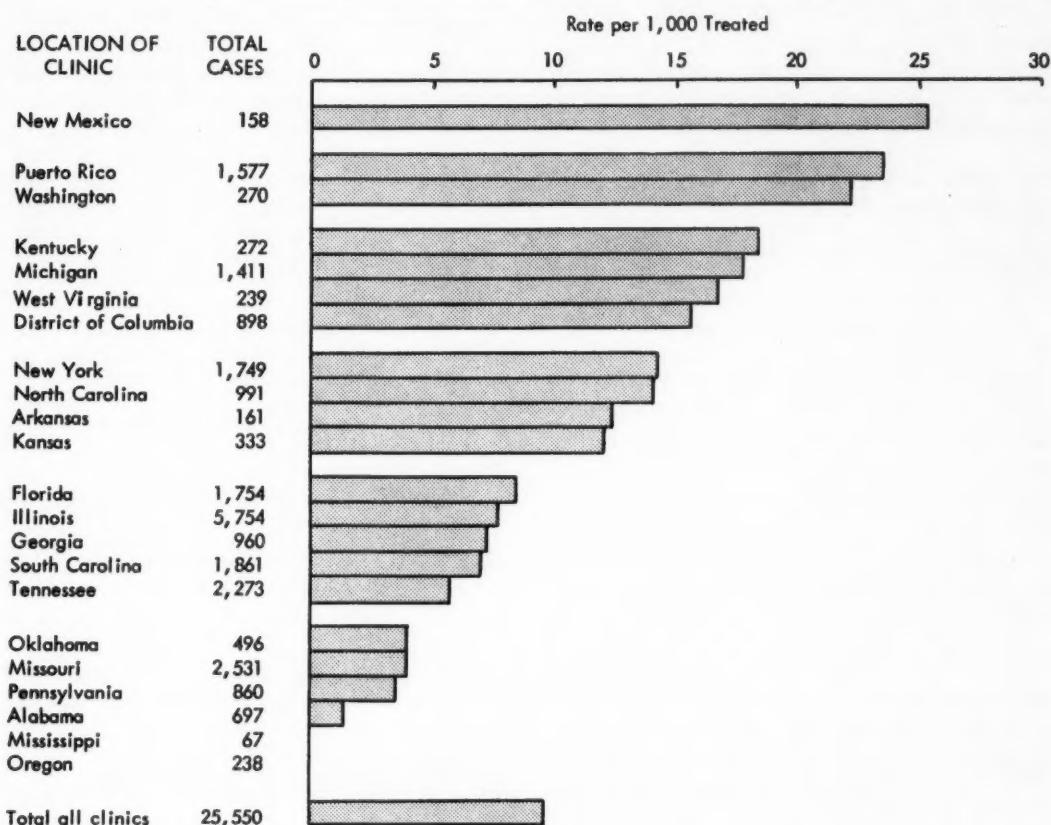
of reactions was less than 1 per 1,000 patients treated. In this group the principal reaction was syncope, which could be caused by fear of needle as readily as by penicillin. No anaphylactoid reactions were observed. The group treated at the centers is composed solely of Mexican male laborers who were given a single injection of 2,400,000 units of benzathine penicillin G. Since the men depart on contracts on the day of treatment, only immediate reactions, or those occurring within a few hours after injection, could be observed. The reluctance of the braceros to report an illness for fear of rejection has been offered by the medical officer in charge as a possible explanation for the almost complete absence of reactions. However, severe anaphylactoid reactions would be difficult to conceal.

Many other factors may have a bearing on the low incidence of reactions. Since the braceros are screened in Mexico, those reaching the reception centers are physically fit for strenuous labor. They may also represent a group less sensitized to penicillin. Certainly few are subjected to the almost continual penicillin therapy administered to chronic repeat-

Table 1. Frequency of reactions in venereal disease clinics and border reception centers

Type of penicillin reaction	Clinics		Border reception centers		All sources	
	Number cases	Rate per 1,000	Number cases	Rate per 1,000	Number cases	Rate per 1,000
Total cases treated.....	25,550		9,946		35,496	
Total cases reacting.....	248	9.71	7	0.70	255	7.18
Urticaria.....	146	5.71			146	4.11
Anaphylaxis.....	27	1.06			27	.76
Moderate to severe.....	9	.35			9	.25
Mild.....	18	.70			18	.51
Serum sickness.....	11	.43			11	.31
Other:						
Vertigo, syncope.....	25	.98	5	.50	30	.85
Generalized pruritus.....	23	.90			23	.65
Gastrointestinal (nausea, vomiting, abdominal pain).....	18	.70	1	.10	19	.54
Chills, fever, headache.....	14	.55	1	.10	15	.42
Angioneurotic edema.....	6	.23			6	.17
Dermatitis medicamentosa.....	4	.16			4	.11
Chest pain, dyspnea.....	3	.12			3	.08
Erythema multiforme.....	1	.04			1	.03
Dermatophytid.....	1	.04			1	.03
Hysteria.....	1	.04			1	.03
Jarisch-Herxheimer.....	1	.04			1	.03
Dysphagia.....	1	.04			1	.03
Unspecified.....	1	.04			1	.03

Figure 1. Comparative incidence of reactions by location of clinic



ers in venereal disease clinics. Only 50 percent gave a history of previous penicillin treatment, consisting principally of the injection received the previous year when crossing the border. Because of the seasonal nature of the program large numbers of braceros are treated in a short span of time, making it unlikely that drugs remain on the shelf very long.

Whatever the reasons, it is obvious that the two groups, braceros at the border reception centers and persons treated at venereal disease clinics, are not comparable. The following discussion, therefore, is limited to data from venereal disease clinics.

There was considerable variation among clinics, reaction rates ranging from 0 to more than 25 per 1,000 patients treated (fig. 1). Factors such as the number of cases treated, the amount and duration of treatment, and post-treatment observation period contributed to this variation.

For example, at the clinic in New Mexico which reported 4 reactions among 158 patients treated (25.3 per 1,000), the routine treatment for syphilis is 9,600,000 units covering a period of 3 weeks; at the clinic in Alabama which reported 1 reaction among 697 patients treated, a single injection of 2,400,000 units is routine for syphilis.

Schedules and Type of Penicillin

The effect on the incidence of reactions of total dosage and duration of schedule is shown in figure 2. The treatment shown is the planned schedule, not necessarily the amount the patient received prior to the occurrence of the reaction. In general, the longer the planned schedule of treatment and the larger the amount of penicillin, the greater the number of reactions reported. The longer schedules, of course, af-

Participating Agencies

Cooperating in the 1959 study to evaluate penicillin reactions among venereal disease patients were the following health departments and border reception centers of the Foreign Quarantine Division, Public Health Service.

Alabama: Montgomery County.

Arkansas: Pulaski County.

District of Columbia: District of Columbia.

Florida: Dade County, Duval County.

Georgia: Bulloch County, Chatham County, Fulton County, Macon-Bibb County, Muscogee County, Richmond County, Ware County.

Illinois: Chicago.

Kansas: Kansas City, Wichita-Sedgwick County.

Kentucky: Louisville-Jefferson County.

Michigan: Detroit.

Mississippi: Harrison County, Scott County.

Missouri: Kansas City, St. Louis.

New Mexico: Bernalillo County.

New York: New York City.

North Carolina: Charlotte, Durham County, New Hanover County.

Oklahoma: Oklahoma City.

Oregon: Portland.

Pennsylvania: Philadelphia.

Puerto Rico: Aguadilla, Arecibo, Barceloneta, Bayamón, Caguas, Cataño, Cayey, Fajardo, Guayama, Humacao, Juana Diaz, Manatí, Mayagüez, Ponce, Rio Piedras, San Juan, Santurce, Vieques, Yabucoa.

South Carolina: Aiken County, Anderson County, Charleston County, Clarendon County, Georgetown County, Greenville County, Richland County, Spartanburg County.

Tennessee: Davidson County, Hamilton County, Memphis-Shelby County.

Washington: Seattle-King County.

West Virginia: Kanawha-Charleston, Logan County, Mercer-Bluefield, Mingo County.

The border reception centers were those at Nogales, Ariz., El Centro, Calif., and three in Texas at Eagle Pass, El Paso, and Hidalgo.

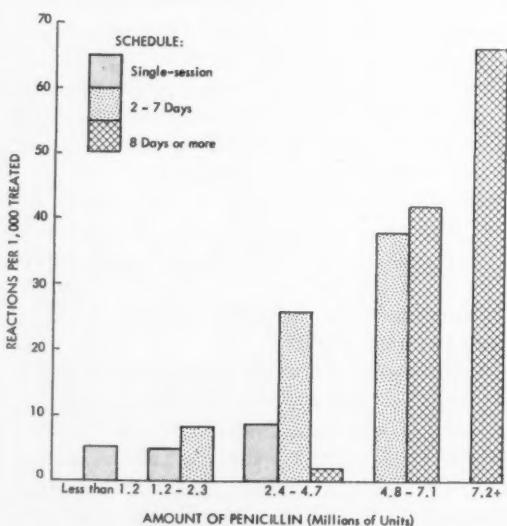
forsed an opportunity for reactions to be observed. An exception to this is found in the group given 2.4 to 4.7 million units in schedules of 8 or more days' duration. This group, which had the lowest rate, was composed principally of women (presumably prostitutes) who were administered two 1,200,000-unit injections 2 weeks apart for prophylactic purposes. On the whole, this is a selected group with a demonstrated tolerance to penicillin.

Among patients treated on single-session schedules, the reaction rate was approximately the same for schedules of less than 1,200,000 units and for schedules of 1,200,000 to 2,300,000 units. However, the rate almost doubled for schedules of 2,400,000 to 4,700,000 units. For schedules of 2-7 days' duration the incidence of reactions ranged from 8.4 per 1,000 patients treated with 1,200,000 to 2,300,000 units to 38.0 per 1,000 treated with 4,800,000 to 7,100,000 units. Correspondingly large increases in reaction rates were observed with increased dosage in schedules of 8 or more days' duration.

PAM (procaine penicillin G with 2 percent aluminum monostearate) and benzathine penicillin G are the drugs of choice in venereal dis-

ease clinics. These two preparations, singly or combined, were administered to 94 percent of the patients included in the study. An additional 3.4 percent were treated with PAB, a

Figure 2. Incidence of reactions by amount of penicillin and duration of schedule



preparation containing both procaine penicillin G and benzathine penicillin G. Only 2.3 percent of the patients were treated with aqueous procaine penicillin G.

The incidence of reactions by type and amount of penicillin is shown in table 2. The type of penicillin plays a relatively unimportant role in the incidence of reactions. Where significant differences are observed, they can usually be explained on the basis of single-session therapy as opposed to treatment of longer duration. For example, in schedules of less than 2,400,000 units, benzathine penicillin G, either alone or combined with PAM, had a significantly lower reaction rate than aqueous procaine penicillin G (3.7 and 4.4 compared with 12.0 per 1,000); however, 98 percent of the benzathine penicillin G was administered in a single session as compared with only 59 percent of aqueous procaine penicillin G. In the 2,400,000 to 4,700,000 unit range, the lowest reaction rate (3.9 per 1,000) followed combined PAM and benzathine penicillin G therapy, 99

percent of which was administered in a single session, usually for gonorrhea, in a total dosage of 2,400,000 or 2,700,000 units. None of the aqueous penicillin, which in this dosage range had a rate of 28.3 per 1,000, was administered in a single session; 93 percent was given in three injections for a total of 3,600,000 units. For the larger dosage schedules, no significant differences were observed among the types of penicillin employed.

Among the many factors thought to influence the incidence of reactions is sensitization of the population to penicillin. In countries such as the United States, some minor illnesses have been treated with penicillin, and there is ample opportunity for exposure to penicillin through dairy products and other foods. This almost universal exposure may account for the similarity of reaction rates among patients who gave no history of previous penicillin treatment and those who were previously treated without incident. The reaction rates for all patients in these two groups were 9.1 per

Table 2. Incidence of reactions by type and amount of penicillin

Type of penicillin	Millions of units			Total
	Less than 2.4	2.4-4.7	4.8 or more	
PAM (procaine penicillin G in oil and 2 percent aluminum monostearate):				
Number cases	8,187	509	1,598	10,294
Cases reacting	49	6	67	122
Rate per 1,000	5.99	11.79	41.93	11.85
Benzathine penicillin G:				
Number cases	3,505	1,821	838	6,164
Cases reacting	13	23	38	74
Rate per 1,000	3.71	12.63	45.35	12.01
Benzathine penicillin G and PAM:				
Number cases	6,309	1,277	29	7,615
Cases reacting	28	5	2	35
Rate per 1,000	4.44	3.92	68.97	4.60
PAB (procaine penicillin G and benzathine penicillin G):				
Number cases	152	689	19	860
Cases reacting	1	6	0	7
Rate per 1,000	6.58	8.71	0.00	8.14
Aqueous procaine penicillin G:				
Number cases	418	106	65	589
Cases reacting	5	3	2	10
Rate per 1,000	11.96	28.30	30.77	16.98
All other:				
Number cases	23	3	2	28
Cases reacting	0	0	0	0
Rate per 1,000	0.00	0.00	0.00	0.00
All types:				
Number cases	18,594	4,405	2,551	25,550
Cases reacting	96	43	109	248
Rate per 1,000	5.16	9.76	42.73	9.71

1,000 for the untreated and 9.0 per 1,000 for the treated; 3.0 and 4.8 per 1,000 for treatment of less than 2,400,000 units; 8.6 and 10.1 per 1,000 for 2,400,000 to 4,700,000 units; and 40.3 and 39.4 for treatment of 4,800,000 units or more.

For all patients who had shown sensitivity to penicillin previously, the reaction rate was 117 per 1,000. Fifty-six of the 154 patients who gave a history of penicillin sensitivity were administered an antihistamine concomitantly with the penicillin, and only 1 in the group had further difficulty. This precautionary measure was not taken with the remaining 98 patients, and 17 experienced another reaction.

Race, Sex, and Age

The incidence of reactions varied according to the race, sex, and age composition of the population under study. The patients of the venereal disease clinics reporting in this study are principally Negro, with the majority under 30 years of age. These are the patients who showed the least sensitivity to penicillin (table 3 and fig. 3). Race is a more important factor than sex. The incidence of reactions was approximately the same in white males and in white females, but significantly greater

in Negro females than in Negro males. Both white males and white females had a greater incidence of reactions than Negroes of either sex.

Age as a factor is somewhat more difficult to appraise since it is directly related to diagnosis and hence to treatment. In general, the younger patients were treated for gonorrhea on low dosage schedules; the older patients for syphilis on high dosage schedules. The significant increase in incidence of reactions with increasing age (from 4.5 per 1,000 aged 10-19 years to 32.7 per 1,000 aged 50 and over), observed for the total, is almost eliminated when amount of treatment is considered (fig. 3). The only differences greater than could be attributed to chance are found in the 2,400,000- to 4,700,000-unit treatment group in which patients aged 40-49 years had a significantly higher incidence of reactions than patients aged 10-19 or 20-29 years.

Diagnosis

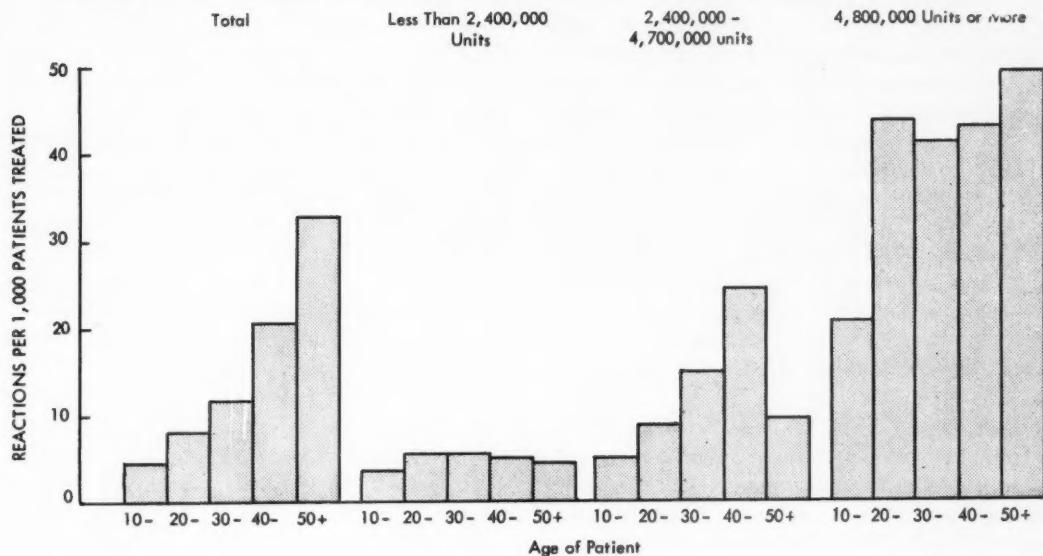
In planned schedules of less than 2,400,000 units, 94 percent of the 18,594 patients were treated for gonorrhea or as contacts to patients with gonorrhea. The incidence of reactions

Table 3. Incidence of reactions by race and sex and scheduled amount of penicillin

Race and sex	Millions of units			Total
	Less than 2.4	2.4-4.7	4.8 or more	
White male:				
Number cases	1, 166	180	200	1, 546
Cases reacting	9	3	12	24
Rate per 1,000	7.72	16.67	60.00	15.52
White female:				
Number cases	832	168	121	1, 121
Cases reacting	6	3	7	16
Rate per 1,000	7.21	17.86	57.85	14.27
Negro male:				
Number cases	8, 843	1, 623	831	11, 297
Cases reacting	40	14	24	78
Rate per 1,000	4.52	8.63	28.88	6.90
Negro female:				
Number cases	6, 205	1, 713	784	8, 702
Cases reacting	29	20	35	84
Rate per 1,000	4.67	11.68	44.64	9.65
Total:				
Number cases ¹	18, 594	4, 405	2, 551	25, 550
Cases reacting	96	43	109	248
Rate per 1,000	5.16	9.76	42.73	9.71

¹ Includes cases with race and sex unspecified.

Figure 3. Incidence of reactions by age of patient and scheduled amount of penicillin



was 5.2 per 1,000 for gonorrhea cases and 4.6 per 1,000 contacts. In planned schedules of 4,800,000 units or more, 98 percent of the 2,551 cases were treated for syphilis and 43.1 per 1,000 experienced a reaction to penicillin. Only the 2,400,000- to 4,700,000-unit treatment group permits a comparison by diagnosis:

Treatment	Number treated	Number reacting	Rate per 1,000
Gonorrhea:			
Contacts-----	769	5	6.5
Patients-----	2,249	16	7.1
Syphilis:			
Contacts-----	425	5	11.8
Patients-----	710	14	19.7

The reaction rates for gonorrhea and for contacts to patients with gonorrhea were approximately the same, 7.1 and 6.5 per 1,000, respectively. Both were significantly lower than the rate for syphilis, 19.7 per 1,000. Although the rate for treatment of contacts for syphilis was slightly higher than for gonorrhea and slightly lower than for syphilis, the differences are no greater than would be expected through chance. The higher rate for syphilis than for gonorrhea still exists when the comparison is limited to treatment of 2,400,000 units administered in a single session (22 compared with 6 per 1,000). A possible explanation may

be that patients treated for syphilis are observed more closely following treatment than patients treated for gonorrhea.

Comparison of 1959 and 1954 Studies

Reactions to penicillin were reported in 5.95 per 1,000 patients treated in 1954 and in 9.71 per 1,000 treated in 1959, an increase of 63 percent. The 1954 study was similar in design to the 1959 study. However, the amount of penicillin in the planned schedule was not requested in 1954, nor were the clinics asked to detain patients in the clinic following penicillin injection. Since 1954 there has been a general increase in the penicillin dosage employed for gonorrhea, with the 600,000-unit routine being replaced at most clinics with a 1,800,000-unit schedule. In 1959, only 15 percent of the gonorrhea cases were treated with less than 1,200,000 units; 70 percent were treated with amounts ranging from 1,200,000 to 2,300,000 units, and the remaining 15 percent received 2,400,000 units or more. The incidence of reactions in these three treatment groups, however, was approximately the same, 6.7, 4.9, and 7.0 per 1,000, respectively. It is difficult, therefore, to attribute the increase in incidence of reactions in 1959 to the increased dosage for gonorrhea.

The two studies are compared by diagnosis and duration of planned schedule in table 4. Significantly higher rates in 1959 occur only for single-session schedules and for the total in each diagnostic group. The 30-minute detention period would have the most effect on the single-session schedules since most patients treated on such schedules are seldom seen following treatment and must be relied upon to report to the clinic if reactions occur. The differences between the two studies for schedules of 2 to 7 days and 8 to 14 days were no greater than could be expected through chance. For schedules for syphilis of more than 2 weeks' duration, the incidence of reactions was greater in 1954 than in 1959.

Further indication that the higher incidence of reactions in 1959 may be the result of the detention period is a comparison of the types of reactions observed in the two studies (table 5). Urticaria, the principal reaction, was reported with approximately the same frequency in both studies. Anaphylaxis was observed

more frequently in 1959 than in 1954. The difference was significant, however, only in those classified as mild. It might be explained that "moderate to severe" includes chiefly patients requiring hospitalization. Reports on two who were exceptions to this follow:

Case 1. "Approximately 30-45 seconds after injection patient became cold, clammy, perspiring, slightly cyanotic, and nauseated. Blood pressure fell to 70/0 but rose to 140/80 about 3 minutes after injection of 15 minims of epinephrine subcutaneous and 25 mg. of benadryl intravenous—and being placed in shock position. Discharged from the clinic 45 minutes later in good condition."

Case 2. "Within seconds after injection, patient collapsed. Pulse too rapid and feeble to count. Treated with oxygen by mask, adrenalin 0.3 cc. subcutaneous stat. Followed by some relief of symptoms. Given 100 mg. Solucortef intravenous and adrenalin 0.2 cc. subcutaneous. After 20 minutes blood pressure 120/80, pulse 70 and regular."

Table 4. Comparative frequency of reactions reported in 1959 and 1954 by diagnosis and duration of planned schedule

Diagnosis and duration of planned schedule	1959 study			1954 study		
	Total cases	Cases reacting		Total cases	Cases reacting	
		Number	Rate per 1,000		Number	Rate per 1,000
Contact treatment	5,938	32	5.39	3,757	10	2.66
Single-session	5,509	27	4.90	3,743	9	2.40
2-7 days	95	4	42.11	13	1	76.92
8-14 days	43		0.00	1		0.00
Over 14 days	291	1	3.44			
Gonorrhea	15,104	83	5.50	12,026	29	2.41
Single-session	14,101	71	5.04	11,877	27	2.27
2-7 days	854	12	14.05	144	2	13.89
8-14 days	105		0.00	5		0.00
Over 14 days	44		0.00			
Syphilis	3,229	122	37.78	3,442	77	22.37
Single-session	622	13	20.90	1,993	15	7.53
2-7 days	815	29	35.58	350	11	31.43
8-14 days	1,099	61	55.51	637	25	39.25
Over 14 days	693	19	27.42	462	26	56.28
All diagnoses ¹	25,550	248	9.71	19,510	116	5.95
Single-session	21,502	122	5.67	17,710	51	2.88
2-7 days	1,768	45	25.45	694	14	20.17
8-14 days	1,252	61	48.72	644	25	38.82
Over 14 days	1,028	20	19.46	462	26	56.28

¹ Includes other and unspecified disease.

Table 5. Comparative frequency of various types of reactions to penicillin in 1959 and 1954

Type of penicillin reaction	1959 study		1954 study	
	Number	Rate per 1,000	Number	Rate per 1,000
Total cases treated	25,550		19,510	
Total cases reacting	248	9.71	116	5.95
Urticaria	146	5.71	96	4.92
Anaphylaxis	27	1.06	4	.21
Moderate to severe	9	.35	4	.21
Mild	18	.70	-----	.00
Serum sickness	11	.43	5	.26
Other:				
Vertigo, syncope	25	.98	-----	.00
Generalized pruritus	23	.90	2	.10
Gastrointestinal (nausea, vomiting, abdominal pain)	18	.70	1	.05
Chills, fever, headache	14	.55	-----	.00
Angioneurotic edema	6	.23	-----	.00
Dermatitis medicamentosa	4	.16	5	.26
Chest pain, dyspnea	3	.12	2	.10
Erythema multiforme	1	.04	1	.05
Dermatophytid	1	.04	1	.05
Hysteria	1	.04	-----	.00
Jarisch-Herxheimer	1	.04	-----	.00
Dysphagia	1	.04	-----	.00
Unspecified	1	.04	-----	.00

Patients with reactions classified as mild anaphylaxis exhibited a combination of approximately three of the following symptoms: syncope, vertigo, profuse sweating, chills, weakness, dyspnea, constriction of chest, respiratory symptoms, abdominal cramps, nausea and vomiting, pruritus, flushing of skin, and angioneurotic edema. It will be noted that these same symptoms are listed as "other" reactions. These constitute a group in which it was felt that either singly or combined the symptoms did not warrant a diagnosis of anaphylaxis. These reactions and those classified as mild anaphylaxis were almost completely absent in the 1954 study.

Although undoubtedly there is a greater awareness today of the risk involved in penicillin treatment, which would account for an increase in the observation and reporting of

reactions, it is felt that the request in 1959 that clinics detain patients for 30 minutes following penicillin injection contributed in large measure to the increase. Reactions such as vertigo, syncope, dyspnea, and others, although of serious import to the clinician, are symptoms (usually transient in nature) which the average person would dismiss as too inconsequential to report. This is substantiated by the fact that 50 percent of the reactions reported in 1959 occurred on the first day of treatment, 30 percent within the first half hour. In 1954 only 16 percent of the reactions reported occurred on the first day.

Fatal Reactions

No deaths occurred at any clinic during its 3-month period of participation in the study. However, one of the clinics reported a fatal reaction which occurred in March 1960, the last month of the collection period. This was the only death in more than 100,000 patients treated by the cooperating clinics during the year.

The patient who died was a 23-year-old Negro man who was admitted to the clinic on March 16, 1960, with a diagnosis of anterior urethral gonorrhea. He had been treated for gonorrhea on November 12, 1959, and again on February 3, 1960, with 1,200,000 units of benzathine penicillin G without difficulty. On March 16 the patient was again given the same dose of this drug. In the next several minutes he complained of feeling ill and nauseated and attempted to vomit into the waste container. He then stood up, stating he felt better and continued dressing in order to leave. At this point the patient collapsed. His condition deteriorated rapidly, pulse and blood pressure were unobtainable, and the patient became unresponsive. Emergency therapy, administered immediately, consisted of oxygen, adrenalin injected intravenously and intramuscularly, and penicillinase given intramuscularly. The patient was pronounced dead approximately 40 minutes following treatment. Unfortunately an autopsy was not performed.

Fatal reactions among venereal disease patients are relatively infrequent, but as this case attests, they are an ever-present possibility. It cannot be too strongly recommended that

every treatment room where penicillin is administered, whether in clinic, hospital, or private physician's office, have in readiness for use at a moment's notice, supplies and equipment for any emergency which might arise. As an added precaution, the patient should be kept under observation following treatment as long as is practicable.

Summary and Conclusions

Sixty-four health departments in 21 States, the District of Columbia, and Puerto Rico and 5 border reception centers participated in a co-operative study to determine the present incidence of reactions to penicillin among patients treated for venereal diseases. During the study period 35,496 patients were treated with penicillin and reactions were reported in 255, or 7.2 per 1,000. More reactions were observed in venereal disease clinics than at the border reception centers, 9.7 as against 0.7 per 1,000. The reasons for this difference are discussed.

In venereal disease clinic patients urticaria was the most frequent reaction, occurring in 5.7 per 1,000. Anaphylaxis was observed in 27 (1.1 per 1,000) but in only 9 was it classified as moderate to severe. Serum sickness was reported in 11. No deaths occurred during the study period. The incidence of reactions varied by source of report from 0 to 25 per 1,000 patients treated.

In general, the longer the planned schedule of treatment and the larger the amount of penicillin, the greater the number of reactions observed. In single-session schedules of less than 1,200,000 units, the reaction rate was 5.3 per 1,000 compared with 66.1 per 1,000 in schedules of 7,200,000 units or more administered in a period of 8 or more days.

No difference in toxicity was observed between the two principal types of penicillin used in venereal disease clinics (procaine penicillin

G in oil with 2 percent aluminum monostearate and benzathine penicillin G). There was no evidence to indicate that patients are becoming sensitized to penicillin; the incidence of reactions was the same in patients who had never had penicillin therapy as in those who had been treated previously without incident. Reactions were frequent among patients who had shown sensitivity previously to penicillin, but in this group antihistamines appeared to reduce the risk.

Race was a more important factor than sex, with Negro patients tolerating penicillin better than white patients; age also appears to be a factor, with the incidence of reactions increasing with age.

The incidence of reactions was greater in 1959 than in 1954 when a similar study was conducted. It is believed that the increase was due to better observation of the patients rather than to increased sensitization to penicillin.

On the basis of these findings, no changes in the present treatment practices in venereal disease clinics are indicated. It is recommended that emergency supplies and equipment be kept in readiness and that patients be observed closely for immediate reactions following treatment.

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Correction

In "Current Status of Syphilis in the United States," by William J. Brown, in *Public Health Reports*, November 1960, change the title of figure 2 on page 991 to read: "Figure 2. Total cases of syphilis reported by private physicians and clinics and hospitals, Pennsylvania, 1958-59."

Enteric Viruses in Wading Pools

SALLY KELLY, Ph.D., and WALLACE W. SANDERSON

ENTERIC viruses have been isolated routinely from sewage, but their isolation from less polluted sources such as streams (1) and well water (2) has been rare. Nor have they been detected in swimming pools. This report describes the isolation of two ECHO viruses from municipal outdoor wading pools operated by the city of Albany, N.Y., during July and August 1959.

Forty-nine samples of wading pool water were obtained as pressings from cheesecloth swabs exposed to the drainage from four wading pools for 1, 2, or 4 days of each week during July and August 1959. The drainage flowed through a pit at least 8 feet deep and was accessible through a manhole no more than 10 feet from each pool.

The cement-lined wading pools were filled with water from the municipal supply, which originated in the watershed of Hannacroix Creek in the Catskill Mountains and was treated by aeration, coagulation, settling, filtration, and chlorination to a nominal residual value customarily used for drinking water. In pools 1 and 3, the water was fed continuously through a central sprinkler during the 12 hours of operation. The water was not replenished in the other pools after the 8 a.m. filling. All four pools were emptied at 8 p.m., and each morning were swept, hosed, sprinkled with a chlorine disinfectant (HTH), and refilled. No residual chlorine from the disinfecting process was detected in the pools during use.

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Contamination of the drainage by backflow of sewage was not likely. The combined sewer to which connection was made from the drainage pit was 50 feet or more away; the conducting pipe was at least 18 inches higher at the sampling site than at the sewer; the coliform density of the drainage was similar to that of the pool samples; rainfall during the period was three-quarters normal, or less.

The water samples were concentrated and stored by methods previously described (3) and were tested for enteric viruses in monolayers of HeLa cells, human amnion and monkey kidney epithelium, and in 1-day-old mice. Mice were observed over a 14-day period. Subcultures were made if the tissue cultures degenerated within 10 days. Agents which were cytopathogenic through two or more subcultures were identified serologically. Attempts to obtain plaque counts of virus from the samples which were cytopathogenic were not successful.

Viral agents were isolated from six samples: three from pool 1, two from pool 2, and one

Table 1. Characteristics of agents cytopathogenic for human amnion tissue cultures isolated from wading pools, Albany, N.Y., 1959

Sample No.	Agent identified	Number of positive tubes in total of 5 tubes inoculated	Incubation period (days)
97-----	E ₁₁	1	3
99-----	E ₃	3	7
104-----	E ₃	4	3, 6, 7
109-----	E ₃	5	2, 7
118-----	E ₃	1	3
119-----	E ₁₁	2	6, 7

Table 2. Most probable number (MPN) of coliform bacteria per 100 ml. catch samples of wading pools, Albany, N.Y., 1959

Date	Pool 1			Pool 2 ¹		Pool 3			Pool 4		
	Morn-	After-	At drain-	Morn-	After-	Morn-	After-	At drain-	Morn-	After-	At drain-
July 20-----	<30		<3,000					<3,000			
Aug. 31-----		9,300		9,300		4,300			230		<3,000
Sept. 1-----		9,100			930		930		730		
Sept. 3-----					1,400		2,300		910		

¹ No samples taken at draining.

from pool 3. None was found in samples from pool 4. The isolated agents were cytopathogenic for amnion tissue cultures and were identified as ECHO viruses: type 3 from pools 1 and 3 and type 11 from pool 2. One agent was isolated from a 24-hour sample, three from 48-hour samples, and two from 4-day samples. Characteristics of the isolations are listed in table 1.

No agents were isolated in mice, monkey kidney epithelium, or HeLa cell cultures.

A measure of the fecal pollution of the wading pools was made by estimating the most probable number (MPN) of coliform bacteria per 100 ml. in catch samples of pool water (table 2). The MPN of samples from one pool ranged from <30/100 ml. in the morning (before use) to 9,300/100 ml. in the afternoon. The MPN was the same in both morning and afternoon samples from pools less well maintained.

That the two ECHO viruses isolated from the wading pools were from widespread infections in the community was apparent from a separate study of the viruses present in raw sewage sampled at the Albany treatment plant. Types 3 and 11 strains were predominant in 1958 and type 3 in 1959.

An indoor swimming pool which was chlorinated to a residual value of from 0.5 to 0.7 ppm free chlorine was tested for viruses during the period November 1958-August 1959.

An outdoor swimming pool which was chlorinated at an average rate of 65 pounds per 24 hours (giving an average value of 0.2 ppm free residual chlorine) was similarly tested during July and August 1959. Both pools were operated by the city and were filled with water from the municipal supply. No agents were isolated from the 82 samples examined.

Conclusion

The isolation of viruses from urban wading pools indicates that a potential health hazard may exist. It may be significant that no virus was isolated from samples of the pool having the lowest coliform density. The failure to detect viruses in chlorinated swimming pools sampled during the same period and in the same area suggests that similar treatment of wading pools is needed.

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First Domestic Waste Stabilization Pond in Pennsylvania

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PENNSYLVANIA'S first waste stabilization pond for treatment of residential sewage was pioneered by the Allegheny County Health Department. The lagoon method of aerobic treatment, established in the western part of the United States, was not used in Pennsylvania until the State sanitary water board in 1958 approved a permit for an experimental project in Hampton Township, a suburban municipality near Pittsburgh.

Since that time the county-supervised pond has established a good record of efficiency, and after reviewing its operation for 1 year, the State board established standards (1) for the construction and use of waste stabilization ponds.

Lagoons, oxidation ponds, and oxidation evaporation ponds are names given to the waste stabilization pond. But whatever the name, the method or process is essentially the same, although there are modifications caused by holding periods and climatic conditions. Successful use of such ponds has prompted many studies by the Public Health Service, State health departments, and local agencies. Information accumulated on the suitability of the ponds as a method of disposal in all temperature zones encountered in the United States indicates that properly designed and operated ponds provide

a degree of treatment equal to that of the trickling filter or activated sludge type of sewage treatment.

During the 1950's the literature became voluminous as interest increased in the use of the waste stabilization pond for treatment of many different wastes, even those from hog farms (2).

The first States to adopt standards for disposal of domestic wastes by this process were located in semiarid regions, and rates of evaporation were important in establishing permissible loading. Consequently, many of the units were designed and constructed as true ponds with no effluent, since evaporation was capable of dissipating the entire liquid influent. The evaporation pond, used where impervious soils and very dry atmosphere exist, is a truly complete treatment process, since there is no post-treatment discharge or percolation into subsurface waters. In such areas, the potential uses of the process are not limited to treatment of domestic or organic wastes but extend to the treatment of toxic materials which must not be discharged to surface or subsurface waters.

In eastern United States, because of the more humid atmosphere, an evaporation pond cannot be used. However, the lagoon may be particularly suitable for sewage disposal in smaller residential communities or developments.

Advantages of the Lagoon

The treatment processes that take place in a waste stabilization pond are as old as mother nature, and have been known for many years. These processes occur continuously in streams and other natural bodies of water. The lagoon is merely a facility for treatment of wastes by

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natural processes to avoid excessive loading of receiving waters. The three requirements for adequate treatment by these processes are dilution, oxygen, and time. The raw waste is diluted by the volume of the pond itself. The algae that develop and grow in the pond generate oxygen. The waste may be retained in the pond for a period of months.

Important to the operation of the facility are chemical, biological, and physical processes. Organic matter is stabilized as the result of a cycle established between bacteria and algae. The bacteria break down the organic matter to carbon dioxide and other products. The algae utilize these bacterial byproducts in the presence of light to produce quantities of oxygen through photosynthesis (see chart).

Since the presence of dissolved oxygen in the water is dependent largely on photosynthetic activity of the algae, the size and nature of the algal community present has significance. Furthermore, sufficient oxygen must be produced during daylight hours to permit aerobic processes within the pond to continue during periods of darkness. Under moderate temperatures and normal light intensity and with controlled loading of the pond, this condition is easily maintained.

The lower temperatures and shorter daylight periods of winter will result in decreased biological activity. Thick ice, particularly when it is covered by heavy snow, will reduce the amount of light available for photosynthesis, the oxygen content of the water may drop to zero, and the pond become anaerobic.

The lagoon may be a permanent installation or an interim expedient. In either case many factors must be considered since the adequacy of a stabilization pond depends on an accurate and thorough analysis of all specific circumstances of the particular situation. Important features to consider are availability of sufficient land, distance of the proposed pond from the source of the waste, local topography, nearness of the site to inhabited areas, nature of the soil, anticipated future usefulness of the land, and nature of waste to be treated. These features account for the principal cost of installation, the primary concern.

If the plans for a growing suburban area include a complete system of sewer lines, the

pond may be considered as an interim measure and located on land that can be developed later for other purposes. Or the pond may be considered as a permanent installation, and the availability of a complete sewer system is of minimum significance, if a portion of the land in a subdivision is suitable only for use as a pond site.

Once it has been decided that a waste stabilization pond is feasible and acceptable for a locality, it can be expanded as the subdivision grows. Thus the cost of the sewage disposal facility becomes directly related to the rate of development, a strong point in favor of the ponds when the cost of installing treatment facilities is considered.

Planning and Design

In 1957 the Allegheny County Health Department became interested in making practical use of the method in the State. The department, a newly organized agency, recognized that one of its foremost problems was sewage disposal in outlying areas where sewers or plans to provide sewers were lacking.

The department's first step was to withhold approval for installing additional individual disposal systems in subdivisions wherever feasible. As a result, it was necessary for developers to install central collection and treatment facilities in accordance with the needs of the particular area. In most cases, secondary treatment would be necessary in order to comply with the requirements of Pennsylvania. The requirements stipulate that (a) sewage discharged directly into major rivers of Allegheny County must receive intermediate treatment resulting in at least 50 percent reduction in biochemical oxygen demand (BOD); (b) any discharge entering streams, other than major rivers, must have a minimum of 85 percent BOD reduction; and (c) additional treatment may be required where continuous flow does not exist in streams receiving discharge. In any instance disinfection is ordinarily required.

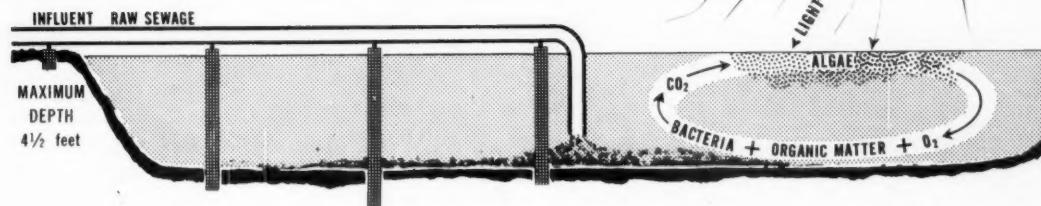
To assure adequate sewage disposal for the subdivisions, the department needed the cooperation of municipal officials, developers, builders, engineers, the planning commission, and the general public. When approached in

regard to the potentialities of waste stabilization ponds, the developers and builders of Allegheny County became interested in the method, particularly since it is less expensive than conventional facilities. The total cost of the pond installation is one-half to two-thirds the cost of conventional treatment facilities, depending on which method of treatment is selected. However, because of extreme fluctuations in the cost of constructing these ponds, the difference may vary widely.

In July 1957, a favorable site was found in Allegheny County for an experimental waste stabilization pond. The site was a swamp with railroad tracks on one side and a cliff, 125 feet below the development area, on the other side. The nearest house in the development was to be approximately 400 feet distant horizontally. The nearest home outside the proposed development was approximately 1,000 yards away.

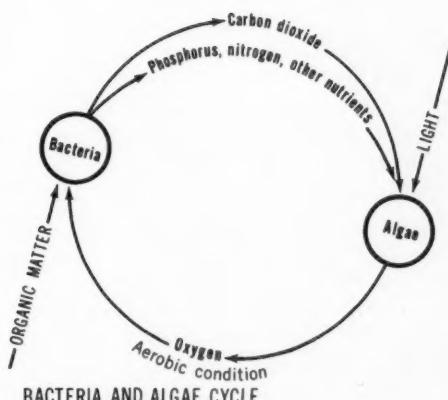
Northwood Acres, the development selected for the initial installation, is located in Hamp-

Sewage disposal by the waste stabilization pond method



Initial requirements

- Light intensity
- Temperature
- Partial pressure of CO_2
- O_2 pressure¹



¹ Presence of O_2 in the decomposition of organic matter (carbon compounds) prevents formation of obnoxious and offensive gases associated with anaerobic digestion.

ton Township in the north central part of the county. The site was considered especially suited since the homes were to be constructed over a period of several years, permitting study of the efficiency of the pond as the load was increased. The ultimate plans were for 143 homes, 37 to be built in the first group.

The developer, Nelson Beggs, and his consulting engineers, North Hills Engineering Co., were receptive to the proposal for installing the facility in consultation with the Allegheny County Health Department. Next, it was necessary to convince the township officials that the method was feasible and that adequate safeguards would be taken to protect against hazards. To reassure the municipality, the developer agreed to provide conventional treatment facilities if the lagoon failed to operate as required.

The township officials were cooperative and submitted the application for the permit required by the Pennsylvania Sanitary Water Board for the installation of sewerage facilities. The preliminary plans were submitted to the State in October 1957. However, considerable clarification and additional detailed supporting data were necessary before a permit was issued at the August 1958 meeting of the sanitary water board. Construction of the pond was started immediately.

The facility has two cells, each with approximately 0.88 acre of surface area, or a total of 1.76 acres (77,000 square feet), joined so they can be operated in parallel or in series. Each cell has a discharge control device to permit maintaining the depth at any level between 2½ and 4½ feet, as well as permitting drawoff at depths of 0 to 2 feet below the surface. The cells discharge to Pine Creek, a tributary of the Allegheny River. The creek flows just beyond the railroad tracks approximately 150 feet from the cells. The influent lines, supported on piers, discharge at the center of the cells. A division box distributes the raw sewage to either or both cells. The entire area is enclosed by a 6-foot chain link fence topped with three strands of barbed wire.

The cliff, although an excellent barrier between the homes and the stabilization pond, created difficulties in constructing sewer lines to the site. In the side of the steep grade bull-

dozers scraped out a ledge wide enough to permit the trenching equipment to operate and to serve later as an access road to the pond.

The heavy equipment was hampered by poor drainage from the swampy area and considerable precipitation during the construction period. As a result, the cost of construction was considerably more than anticipated. Nevertheless, the first cell was placed in operation on October 15, 1958, receiving wastes from 26 homes.

Plans to pump stream water into the cell to provide dilution to the initial flows were found unnecessary. Two weeks after the introduction of waste into the unit, an excellent algal growth had developed. By the end of November, an ice cover formed over the entire cell except around the influent line, and later reached a maximum thickness of 11½ inches. Although the ice cover remained until the middle of February 1959, no nuisance developed during the critical thaw period. No discharge occurred during the winter of 1958-59.

The second cell, completed in July 1959, was immediately placed in operation in series with the first cell. No discharge to the stream occurred until October 1959.

Experimental Studies

The Allegheny County Health Department had agreed to have experimental studies conducted on the operation. The National Home Builders Association, through the Metropolitan Home Builders Association of Pittsburgh, provided a research grant to pay for part of the cost of the studies.

Because of the possibility that an obnoxious odor might develop, a mechanical hydrogen sulfide detector was placed at the proposed site during May 1957, before starting construction, to determine baseline concentrations of the gas. This instrument is capable of detecting H₂S gas at about one-half part per billion (ppb), which is well below the threshold of 100 ppb, the lowest point at which a person can detect its presence. The instrument was operated for a period of 430 hours during May 1957. Of the 215 samples collected, 67 percent had between 0 and 1 ppb of H₂S, with the highest reading between 7 and 8 ppb. The method of measurement was in accordance with recom-

mended procedures of the American Iron and Steel Institute (3).

Since November 25, 1958, the instrument has been in continuous operation. Through December 31, 1959, 5,601 2-hour samples were collected. Fifty-seven percent of the samples remained below the 1 ppb concentration. Though the increase is significant, it has remained below the odor threshold except for two occasions.

Other studies have been conducted to determine the type and quantity of oxygen-producing algae present and the reduction of intestinal organisms through the two cells. Chemical analyses have been done to ascertain the BOD, indicating the degree of stabilization accomplished by each cell, the dissolved oxygen concentration in each cell, and the pH or hydrogen ion concentration.

Some published reports indicate the presence of a wide variety of algal species in waste stabilization ponds. However, in this pond the algal community was composed of very few species. During most of our study the algal community was dominated by *Chlamydomonas*, with a smaller number of *Euglena*, both single-celled motile algae. Following the thaw period in February 1959 the total algal population decreased. *Euglena* increased in relative numbers during April and all but disappeared in May. A few pennate diatoms were present during May.

During the first winter of operation, when only the first cell was being used, *Chlamydomonas* was present in high concentrations even under the 1½ inches of ice. At no time during the first year of operation did the pond become anaerobic. With continued low temperatures and a heavy ice cover (but little snow cover) sufficient light penetrated the ice to permit photosynthesis. In contrast, during the second winter of operations heavy snow lay on the ice for nearly 2 months, and the first cell became anaerobic during the latter part of December 1959.

Results of weekly determinations of suspended organic matter by centrifugation and gravimetric procedures indicated that suspended substances, including the algae, were not evenly distributed within the pond. Differences in vertical distribution of the algae re-

sult in part from the positive responses of the motile cells to light; also, daytime surface concentrations are easily moved about by the wind and tend to become concentrated on the leeward side of the pond. Variation in the algal population at specific sampling points was evident from one week to another from both cell counts and measurements of extractable chlorophyll. This reflects to some extent the unequal distribution of organisms as well as differences in growth rates resulting from daily variations in temperature and light intensity.

Because of the relatively constant supply of nutrient elements available from breakdown of the organic wastes by bacteria, the extreme fluctuations in algal populations characteristic of many natural ponds and lakes were not observed. Concentrations of algal cells in this pond reached 1 million cells per milliliter. This compares with 700,000 cells per milliliter developed during the summer blooms in highly productive lakes and reservoirs (4) and with concentrations of nearly 100 million cells per milliliter produced in large-scale experimental cultures (5).

The data obtained from the chemical and bacteriological studies are shown in the table. Although the number of coliform organisms contained in the influent is reduced more than 99 percent, the discharge still contains appreciable numbers. In the event enteric pathogens are being emptied into the lagoon, possibly they would also be carried over with the discharge. In order to determine if this could occur, the survival of enteric pathogens in the lagoon content was studied in the laboratory. Numerous tests were carried out to study this point.

The tests were conducted essentially as follows. Portions of influent and effluent as received in the laboratory for other testing were transferred to sterile tubes and to each was added a heavy suspension of *Salmonella* organisms. The tubes were kept at room temperature, and their contents were cultured at intervals of 1 or 2 days to detect the presence of the salmonellae among the coliform organisms. The numbers of *Salmonella* organisms rapidly decreased and the maximum survival time in either of the fluids was 12 days. The Coliform organisms, however, showed very little reduction in numbers in this time.

These tests indicate that if a carrier of *Salmonella* organisms lived in the development and was discharging wastes into the lagoon, these pathogenic organisms would die off before being discharged to the stream. Months are required before influent becomes discharge. It can be concluded that even though some coliform organisms are discharged to the stream, there is little chance that these enteric pathogens will be discharged.

Loading Capacity

The first cell of the facility has been loaded at the rate of 350 persons per acre (311 people on 0.88 acre) since November 1959. This amounts to a loading of 175 people per acre on the two combined cells, which is approximately double the designed loading rate. In February 1960, a 72-hour continuous sampling program

was conducted by the Pennsylvania State Health Department and the Allegheny County Health Department to determine efficiencies at that level. During this period, both cells were covered by 2 inches of ice, and the air temperature ranged from 10° F. to about 32° F. Samples were collected at 30-minute intervals and included the raw sewage entering the first cell, the discharge from the first cell (this being the influent to the second cell), and the discharge from the second cell to the stream. Flow measurements were taken from the influent to the first cell. Samples for 24-hour periods were composited, and aliquots were taken to laboratories of the State and the county health departments. The results obtained by both laboratories were comparable and varied within a range of only 2 percent.

During the 72-hour sampling period the first cell continued to operate under the anaerobic

Monthly¹ summary laboratory analysis, waste stabilization pond, Hampton Township, Allegheny County, Pa.

Month	Dissolved oxygen (ppm)		Biochemical oxygen demand (ppm)					Coliform bacteria (number per ml. × 10 ³)				
	Cell 1 ²	Cell 2 ²	In-fluent	Effluent		Percent reduction		In-fluent	Effluent		Percent reduction	
				Cell 1 ²	Cell 2 ²	Cell 1	Cell 2		Cell 1 ²	Cell 2 ²	Cell 1	Cell 2
<i>1958</i>												
December	7.22	-----	361	27.5	-----	92.4	-----	345	3.08	-----	99.1	-----
<i>1959</i>												
January	9.40	-----	221	20.4	-----	94.6	-----	258	2.38	-----	99.1	-----
February	12.2	-----	186	22.7	-----	87.6	-----	527	3.38	-----	99.3	-----
March	12.9	-----	369	21.5	-----	94.1	-----	490	1.47	-----	99.7	-----
April	8.36	-----	272	20.0	-----	92.6	-----	1,004	31.10	-----	96.9	-----
May	6.07	-----	261	12.0	-----	95.5	-----	286	1.06	-----	99.6	-----
June	.767	-----	275	27.0	-----	90.3	-----	1,895	1.58	-----	99.92	-----
July	4.17	5.13	209	17.4	17.4	86.9	86.9	1,633	.37	0.09	99.98	99.994
August	3.94	5.05	327	20.3	22.7	93.6	93.0	1,874	3.90	.39	99.79	99.979
September	5.55	5.93	332	19.3	17.5	94.2	94.8	2,111	12.63	.38	99.40	99.982
October	6.90	6.55	390	36.5	21.3	90.6	94.5	1,390	3.80	.19	99.73	99.987
November	5.10	4.77	250	26.3	28.5	89.4	88.5	1,390	24.0	2.40	98.27	99.829
December	4.10	2.50	200	39.8	12.1	80.1	93.9	295	24.0	2.40	92.20	99.187
<i>1960</i>												
January	.22	6.35	315	53.3	23.0	83.0	92.7	1,390	24.0	2.40	98.27	99.829
February	.38	10.20	205	71.0	27.4	65.4	86.6	1,333	19.0	2.40	98.57	99.819
Average	5.82	5.81	279	29.0	21.2	88.7	91.4	1,082	10.4	1.33	98.65	99.826

¹ Monthly results are based on average results of two samples per week.

² Samples taken from established points of discharge from the cell.

conditions which had developed during the latter part of December 1959, and the BOD reduction was 73 percent. The cold weather continued through February and the average reduction through the first cell was about 66 percent (see table). Although the second cell was also covered by 2 inches of ice during the study, the BOD reduction of the discharge of the second cell to the stream was 89 percent, and the sampling for February indicates an average reduction of 87 percent through the combined cells.

The measurements during the 72-hour sampling period indicated an average flow of approximately 12,190 gallons per day for 311 people, or 39 gallons per person per day. The 2-foot storage available between the 2½- and 4½-foot (minimum and maximum) operating depths permits the storage of approximately 1,155,000 gallons. This provides storage, at the present rate of flow, for 90 to 100 days. With this storage capacity available and the continued high BOD reduction through the combined cells, it is conceivable that the loading can be increased and the desired efficiencies maintained at all times during discharge to the watercourse.

The results obtained in operations and tests have been quite satisfactory and the degree of treatment has continued to be good. However, detailed tabulations show that cold weather, particularly ice and snow cover, affects the efficiency of the pond. The rate of recovery during spring weather to aerobic conditions will be significant in determining eventual loading capacities. At the present loading rate of 350 people per acre, the first cell is capable of providing greater than 85 percent BOD reduction except for periods of snow and ice cover. The maximum capacities of the two cells combined have not yet been determined, but at no time has the BOD reduction through the combined units been below the 85 percent minimum required by the State.

The efficiency of operation during the winter and spring months of 1959-60 will have considerable significance since the first cell became anaerobic during the latter part of December. A slight odor developed in the immediate vicinity of the pond although it could be

detected only at very close range, and it did not attain the magnitude of a nuisance. During one period when the ice cover melted, oxygen returned to the first cell in significant quantity after only 3 days of relatively warm sunny weather.

Summary

An experimental project in Allegheny County, Pa., a stabilization pond for treatment of domestic wastes, illustrates that the semiarid conditions of some western States are not necessary for the efficient operation of a lagoon. However, high evaporation rates undoubtedly increase the potential uses of this method of waste disposal.

Based on the temporarily established load levels of 175 persons per acre of lagoon surface area the following observations were recorded. The minimum biochemical oxygen demand reduction was 87 percent. Algal growth rapidly reached a maximum level of 1 million cells per milliliter. Hydrogen sulfide gas levels have remained at an acceptable level except on two occasions, when odors could be detected in the immediate vicinity of the pond. The reduction of coliform organisms was more than 99 percent. Preliminary studies indicate a complete removal of the *Salmonella* enteric pathogens.

Although maximum loading capacities have not been reached, the lagoon method has proved feasible in this area. It is especially suited where no regular sewer systems are available and where topographic and climatic conditions are appropriate. However, further experiments must be conducted to determine the maximum loading capacities of lagoons in this climate. Preliminary studies indicate enteric pathogens cannot survive in the full sequence of lagoon operation, but further detailed studies are needed to establish this conclusively.

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Surgeon General Terry

DR. LUTHER L. TERRY, assistant director of the National Heart Institute since August 1958, has been designated as the new Surgeon General of the Public Health Service. He succeeds Dr. Leroy E. Burney, Surgeon General since 1956.

One of the pioneers in research into the body's enzyme system, Dr. Terry has been a key man of a team of doctors who for 3 years have been developing enzyme-inhibiting drugs to fight high blood pressure.

Dr. Terry entered the Public Health Service in September 1942, assigned to the U.S. Marine Hospital (now U.S. Public Health Service Hospital), Baltimore, Md. He was chief of medical service from 1943 to 1953, when he became chief of the General Medicine and Experimental Therapeutics Branch of the National Heart Institute. Since 1944 he has also been on the staff of the Johns Hopkins University School of Medicine, becoming assistant professor of medicine in 1953.

Born in Red Level, Ala., September 5, 1911, Dr. Terry received his bachelor of science degree in 1931 from Birmingham-Southern College and his doctorate in medicine in 1935 from Tulane University of Louisiana School of Medicine.

From 1937 to 1942 he served successively as resident in medicine and intern in pathology at City Hospital, Cleveland; instructor in medicine and research fellow in pneumonia at Washington University, St. Louis, Mo.; instructor and associate professor of medicine and of preventive medicine and public health at the University of Texas, Galveston.

Dr. Terry was a member from 1945 to 1946 of the Medical Division of the Strategic Bombing Survey to Japan and was staff member of the Subcommittee Investigating Malmedy Atrocities, Senate Committee on Military Affairs, in 1949. He is past chairman of the Medical Board, Clinical Center, National Institutes of Health, and of the Cardiovascular Research Training Committee, National Heart Institute, and is a member of various organizations in the medical and public health fields.



A Comparative Study of Caries Experience in Adventist and Other Children

CHARLES J. DONNELLY, D.D.S., M.P.H.

IN A STUDY of dental diseases in Seventh Day Adventist families during 1957-59, it was noted that the children of all ages had less dental caries than normally would be expected. The children examined were at eight Adventist camps located in different parts of the United States. However, the findings did not show the usual geographic differences brought out in previous studies (1,2). The children's means for decayed, missing, or filled (DMF) teeth were uniformly low.

Recently Downs, Dunn, and Richie (3) reported that Adventist children in both Grand Junction and Denver, Colo., had less dental caries than other children residing in these two cities.

Methods

The present study was undertaken to investigate further the caries experience of Adventist and non-Adventist children under comparable conditions. Prince Georges and Montgomery Counties, Md., were selected principally because of the concentration of Adventists near Takoma Park, Md., the church's international headquarters. There are six Adventist schools in this area with an approximate enrollment of 1,200 students in grades 1 through 12. In this investigation only children 6 through 15 years of age were included.

The control group, part of the sample being observed in the fluoridation study in Prince

Georges and Montgomery Counties, was composed of white children from six public schools in the two counties. The children selected had resided continuously in the area since birth and had not received topical fluoride applications or other caries-inhibitory agents (4-6). Both the Adventist and the public schools are in the zone served by the Washington Suburban Sanitary Commission, which began fluoridating its water in December 1951.

All examinations were made by the author with mirror and explorer under adequate light. "Catches" were not counted as carious lesions in the absence of other indications of caries.

During January and February 1959 approximately 3,000 public school children were examined. Of this group, 1,438 aged 6 through 15 years met the requirements of the control group. Dental examinations were completed in five of the Adventist schools during May 1959, and in the sixth during October 1959. The number of years the child had been a Seventh Day Adventist, as well as the continuity of residence, was determined.

Only 290 of 887 children in Adventist schools could be classified as lifetime Adventists with continuous residence in the study area. Approximately 10 percent could not qualify because they either were not Adventist or had not been Adventist all of their lives. The remainder were eliminated for failing to meet the residence requirement or because they had received topical fluoride applications. No attempt was made to determine the complete history of type of water consumed by the non-continuous residents.

On statistical analysis, no differences were

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found among the groups examined in the six Adventist schools with respect to their dental caries experience. Therefore, they have been combined for comparison with the control group. Likewise, no differences were found among the six public school groups.

The sample from the Adventist children had a mean age of 10.27 years; that from public schools, 11.09 years (table 1). Each group was about equally divided between male and female.

Findings

The mean number of teeth in eruption for the public school pupils did not vary greatly from the mean number for the continuous resident lifetime Adventist children. The variation was less than a quarter of a tooth per child for five age groups and approached a full tooth for the 9- and 11-year-olds. The Adventist students had the higher mean number of erupted teeth for most ages.

The level of professional care was somewhat higher among the Adventist children. Unmet needs, that is, decayed teeth, plus teeth indicated for extraction, made up only 8.2 percent of the Adventist's total DMF mean. Filled teeth contributed 89.0 percent. For the public school children, the unmet needs accounted for 22.6 percent of the total DMF and filled teeth 70.3 percent.

Table 1. Distribution by age and sex of continuous resident Adventist and public school children, Prince Georges and Montgomery Counties, Md.

Age last birth-day (years)	Lifetime Adventist children		Public school children	
	Male	Female	Male	Female
6	16	16	74	68
7	19	21	70	83
8	21	16	83	83
9	17	20	63	48
10	10	24	53	38
11	13	12	27	33
12	19	11	113	105
13	17	14	85	123
14	4	5	110	107
15	5	10	39	33
Total	141	149	717	721

Table 2. Mean number of DMF teeth for continuous resident Adventist and public school children, Prince Georges and Montgomery Counties, Md.

Age last birth-day (years)	Lifetime Adventist children		Public school children	
	Number examined	Mean number of DMF teeth	Number examined	Mean number of DMF teeth
6	32	0.09	142	0.15
7	40	.10	153	.23
8	37	.57	166	.81
9	37	1.16	111	1.31
10	34	1.26	91	2.04
11	25	1.40	60	2.27
12	30	1.23	218	3.61
13	31	1.87	208	4.86
14	9	5.44	217	5.91
15	15	5.27	72	6.92
Total	290	2 1.49	1,438	2.93

¹ The mean is significantly different at $P=.001$ level.

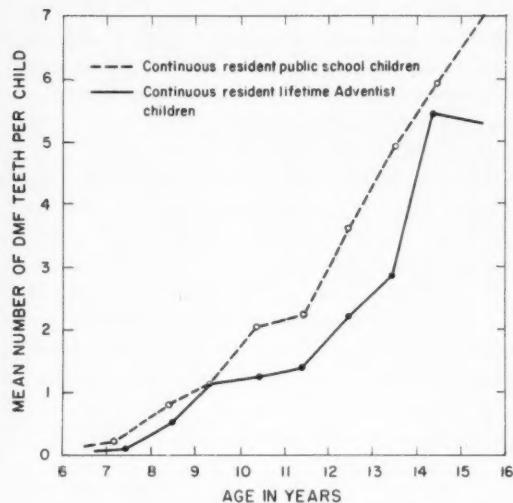
² Adjustment for differences in age distribution, using distribution of public school children as a standard, produces a mean of 2.30 DMF teeth.

A comparison of the mean number of DMF teeth for the continuous resident lifetime Adventist children and the public school continuous residents shows a striking similarity for both groups in the ages 6 through 9 years (table 2 and the figure). The Adventist group ages 10-13 years appears to have experienced less dental caries than its public school counterpart.

When adjusted for differences in the frequency distribution of the age groups of Adventist and public school children, the overall DMF mean of the continuous resident lifetime Adventist was raised from 1.49 teeth to 2.30 teeth. The overall DMF mean for the continuous resident public school children was 2.93 teeth.

Because the Adventist children were examined later in 1959 than the public school children, they had the advantage of a few additional months of fluoride exposure. To evaluate this additional benefit, the reduction in DMF teeth for the continuous resident public school children examined in 1959 was computed on a monthly basis. Then, for the Adventist children examined in May and October, adjust-

Caries experience of Adventist and public school children examined in Prince Georges and Montgomery Counties, Md.



ments of 3 and 10 months, respectively, were made. This correction raised the mean DMF teeth of the Adventist students slightly but not importantly. For example, the observed mean number of DMF teeth for the 12-year-old Adventist was raised from 2.23 teeth to 2.34 teeth.

Relatively more Adventist than public school children were caries free. Again, the difference between the groups is more pronounced for children 10 years of age and older (table 3).

Discussion

The mean number of DMF teeth for the continuous resident lifetime Adventist might be expected to approximate closely the mean of the public school continuous resident children. This expectation holds true for ages 6 through 9 years, the age groups which would benefit most from 7 years of fluoridation. For these ages the DMF curve for the Adventist is slightly but not importantly lower than that for the public school children. From age 10 through 14 years, there is a more noticeable discrepancy between the recorded caries experience of these groups. The differences in DMF means of continuous resident Adventists and public school children are significant for ages 12 and 13 years ($P = .001$).

Apparent differences in the DMF means of children who are erupting or have recently erupted their premolars and second molars should be interpreted with caution. DMF means are influenced by the length of time teeth are at risk of attack. In this study because eruption was accelerated in most age groups of Adventist children, the tendency would be to raise the DMF mean slightly.

One explanation of these apparent differences is that there is some aspect of the Adventist way of life which inhibits caries attack but is made imperceptible by the effect of fluoride ingestion. Assuming that the difference in the DMF means of Adventist and public school

Table 3. Proportions of caries-free continuous resident Adventist and public school children, Prince Georges and Montgomery Counties, Md.

Age last birthday (years)	Lifetime Adventist children			Public school children		
	Number examined	Caries-free		Number examined	Caries-free	
		Number	Percent		Number	Percent
6	32	29	90.6	142	132	93.0
7	40	37	92.5	153	123	80.4
8	37	26	70.3	166	105	63.2
9	37	19	51.4	111	52	46.8
10	34	18	52.9	91	30	33.0
11	25	13	52.0	60	18	30.0
12	30	16	53.0	218	30	13.8
13	31	8	25.8	208	13	6.2
14	9	0	0.0	217	6	2.8
15	15	2	13.3	72	2	2.8
Total	290	168	57.9	1,438	554	37.7

children is a real one, we can estimate from table 2 that portion which is not accounted for by fluoride ingestion. For ages 10, 11, 12, and 13 years, this difference is approximately 40 percent. The differences between the mean DMF of these four age groups of Adventist children and their public school cohorts examined in the 1952 prefluoridation baseline study are 59.2, 68.1, 55.0, and 53.5 percent, respectively, and are not unlike the difference expected with lifetime consumption of fluoridated water (6). The failure of the 14-year-old Adventist children to show a marked difference may be a reflection of the small number of examinees at this age.

The findings in this study suggest that if there is a caries-inhibitory factor in the Adventist way of life, it is active in children 10 years of age and older. Because the mean DMF was lower than expected for children of all ages examined at the Adventist camps, there is reason to suspect that such a factor would act at an earlier age. In this study the mean DMF of the younger Adventist children who have received the maximum benefit of fluoridation is similar but not appreciably lower than that of their public school cohorts, suggesting that the Adventist way of life may offer a type of protection against dental caries not unlike that of fluoride ingestion.

Downs, Dunn, and Richie (3) in their report of caries experience of Adventists and non-Adventists in Colorado suggest that the lower rate among the Adventists might result from their educational program which discourages the excessive use of sweets and snacking between meals.

Summary and Conclusions

During 1959, the caries experience of 290 Seventh Day Adventist children living continuously in Prince Georges and Montgomery Counties, Md., was compared with that of 1,438 continuous resident public school children of the same area. At certain ages, there are unexplained differences, favorable to the Adventist, in the mean number of DMF teeth.

Further investigation of a possible caries inhibitory factor in the Adventist way of life seems indicated. Because in this study fluoridation may have made the inhibitory factor imperceptible, it would be desirable to select for study an area where caries attack is not influenced by the ingestion of waterborne fluoride.

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Clarification

In "Bovine Mastitis," *Public Health Reports*, October 1960, page 972, statement No. 2 under "Disposition of Mastitic Mammary Secretions," has been revised for clarification.

The recommendation should read: "Discard from market milk supply for at least 72 hours from last infusion all mammary secretions of any cow which has had one or more quarters infused with antibiotics."

Promoting Dental Health Care

H. GRANT SKINNER, M.D., M.P.H., and EUGENE E. SABOTTA, M.A.

ROdeo trains, films, and plastic-tooth jewelry generated active participation in a dental health campaign for primary school children in Stevens County, Wash., during 1959. The drive, conducted by the Stevens County Health Department, aimed at promoting remedial action for children in need of dental attention.

The campaign originated in a request from the county department to the Washington State Health Department for help in planning a program for children who had not been covered in a previous drive. Rapid dental inspections were being made periodically throughout the schools in the State by members of the local dental societies, each time renewing the interest of parents, teachers, and children in dental health. Here was the opportunity to channel that renewed interest into remedial action. The State health department came through with help in the way of advice on program design, methods of carrying it out, and presentation of results within a statistical matrix.

Plans drawn up under the direction of Dr. Merle B. Snyder, Stevens County health officer, called for a program spanning the school year. The focus was on the pupils' 6-year permanent molars, because these four teeth are important in the formation and development of the dental arch and have high decay risk. They are the first permanent teeth, arriving early in the primary school experience of the child. Followup by the county public health nurses,

May Alm and Belle Howard, was scheduled during the program year with the cooperation of the individual schools.

Early investigation showed conditions that augured success. The 6-year molars among children in the county frequently required dental attention, and, in many instances, neglect came only from ignorance of the need for repair or from apathy thought to be correctible.

The initial steps were directed toward alerting adults, especially teachers, and children to the need for dental care. The techniques included publicizing the program in the local newspapers, describing it to teachers, and supplying program material to the schools, where the message was then carried to the children.

Next, Dr. J. H. Kennedy, a local practicing dentist, conducted a rapid dental examination in the nine schools, with emphasis on repair needs of the 6-year molars. Other defects were noted too, and any fissure or pit requiring treatment was classified as a cavity.

As the drive gained momentum, the primary effort to stimulate motivation was applied to the children themselves. They participated actively by "joining" a rodeo train or a variation of the idea. The train is a cardboard engine with cars which the child boards with a ticket showing that he has molars intact or cared for by the dentist. The teacher was careful to allow those children who had lost their molars or who could not get repairs to get on eventually. Children riding the train were handed plastic 6-year molars to wear. Toothbrushes were also distributed. Other stimulating features were the filmstrip about "Elmer"—the little boy who learned to like his dentist—and educational materials, films, and slides from the local and

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State health departments, the American Dental Association, and the National Dairy Council.

Results

Findings from followup of 183 children with 6-year molars showed that the response to the drive varied widely by school (see table). At one extreme was school A with an increase of 200 percent in the number of children with normal or filled 6-year molars, and at the other, school I showed no change in that number. For all schools as a group, however, the tally clearly indicates, even in this preliminary evaluation, that the program was effective. The total gains in children with normal, filled, or unerupted 6-year molars are statistically significant ($\chi^2=23.54$, $df=1$, $P<.01$). As shown in the table, of the 57 children with cavities after the program was initiated, a number have treatment plans underway, leaving us with a core of 35 children who require more followup. They represent 34.3 percent of the original group with cavities before the program began. The children of school I contributed 13.7 percent of the original group. A reexamination of the children's teeth is scheduled, making possible a fuller evaluation of the program's effectiveness in other dental treat-



As dental work was completed, each child got to put his picture in the train

ment and any change of status in the 6-year molars.

Assessment

Whether or not this study was a fair test of the program can be determined in the light of the program's purpose. The goal was to channel into positive remedial action interest in the children's health, which was periodically

Results of 6-year molar program in Stevens County, Wash., 1959

School	Number of children	Condition of 6-year molars before and after program					Disposition of children with cavities after program			
		Normal, filled, or unerupted		Cavities			Work underway	Appointment made	Promised cooperation	No response
		Before	After	Before	After	Percent change				
A	12	3	9	9	3	-66.7	1	0	0	2
B	28	11	19	17	9	-47.1	3	3	0	3
C	51	26	44	25	7	-72.1	1	3	0	3
D	13	9	12	4	1	-75.0	0	0	0	1
E	20	6	10	14	10	-28.6	0	5	1	4
F	15	6	8	9	7	-22.2	0	1	0	6
G	11	3	6	8	5	-37.5	1	0	2	2
H	10	8	9	2	1	-50.0	1	0	0	0
I	23	9	9	14	0	-----	0	0	0	14
Total	183	81	126	102	57	-44.1	7	12	3	35
Percent	100.0	44.3	68.9	55.7	31.1	-----	3.8	6.6	1.6	19.1

reawakened by dental examinations carried out routinely in the schools.

Thus far, data received and tabulated indicate that, almost without exception, the children responded well. The reasons varied. Some were excited over the new toothbrushes. Others were more interested in qualifying to "join the rodeo train." These differences, of course, may reflect variations in emphasis among the teachers.

No direct information has come in about the effect of the program on parents. We know that in some schools, mothers' clubs donated toothbrush kits at the onset of the project, but this interest does not always persist. To sustain parental interest, it might be advisable to enlist the help of PTA groups.

Teachers, a key link in the campaign, responded favorably on the whole. In schools where the teachers were enthusiastic about our plans, invariably we found good progress in reducing cavities in the children's 6-year molars. In one school where the teacher had decided that the parents "would not or could not follow-through," little effort was made to bring the

program to the children. As a result, we found no change in that school in the number of children with cavities in their 6-year molars.

Followup activities were continued in 1960, with excellent cooperation in schools A, C, and D and some cooperation in F, G, and H, according to comments of the public health nurses who are working with them. The schools with the poorest record in 1959, B, E, and I, were inactive in 1960, but five new schools were added. Four of the new schools were exceedingly enthusiastic, and the fifth exhibited some cooperation.

In theory, the project is designed to appeal to everyone concerned with children's health. In this case, the field application of the program was oriented toward stimulating school personnel first, then students who had unmet dental needs. Although this limited application in Stevens County appears to give good results with an economy of effort and money, for optimum returns from the program, full cooperation must be achieved from all interested groups.

Hospitals to Report Adverse Drug Reactions

The Food and Drug Administration has announced that all 15 of the Public Health Service Hospitals have subscribed to its program for reporting unusual or adverse reactions to drugs. Nineteen other major hospitals have subscribed so far and many others are expected to do so.

The program is designed to develop information promptly on the untoward effects of drugs, especially the newer drugs. The Food and Drug Administration will use the information in resolving medical and administrative problems under the Federal Food, Drug, and Cosmetic Act.

Prior to release for general use, the Bureau of Medicine of the Food and Drug Administration evaluates the safety of new drugs.

Notwithstanding a careful check of the submitted data, wide clinical use may disclose effects not apparent in the investigative studies. When these become known, appropriate measures are taken to afford a greater degree of patient protection. Remedial steps necessary on the part of the drug manufacturer or distributor may vary from a change in the labeling, to alerting physicians and others responsible for patient care, to complete removal of the drug from the market.

The Food and Drug Administration has previously had to rely on the published literature and sporadic reports from physicians, institutions, and pharmaceutical manufacturers to supplement its own small staff in following up on experience with new drugs.

IRRITATION FROM RESIDUAL BROMIDES

AFTER METHYL BROMIDE FUMIGATION

Ben H. Miller, B.Ch.E.

Remo Navone, B.S.

Minoru Ota, B.A.

AFTER a private home in California was fumigated with methyl bromide gas, the local county health officer called the California State Health Department about a severe irritation experienced by the occupants.

Investigators from the bureau of occupational health of the State department of public health were assigned to visit the home. They learned that after the house had been fumigated to eliminate termites, it was "aired out," and the family who had occupied the house moved back in. Almost immediately the family experienced an irritation which they associated with the fumigation. All four members of the family, particularly the 2-year-old child, suffered from irritation of the eyes, nose, throat, and skin. Even the dog was affected. The irritation was persistent and was particularly severe on damp nights. The family finally felt they could not continue to live in the house and moved out into the garage and a tent, where they were living at the time of the State health department investigation.

Although the effects reported seemed to be associated with the fumigation, the precise origin or the nature of the substance that caused the irritation was not known. Methyl bromide

liquid is highly volatile and would be expected to vaporize completely and be lost to the outside atmosphere during the "airing out" procedure.

The Investigation

The fumigator, a qualified contracting pest control operator, stated that he did not know the source of the irritation, but remarked that after the fumigation he had found the kitchen stove was corroded and had replaced it. However, in his work on about 200 such jobs, he had never known of a similar occurrence. He said that 40 pounds of methyl bromide had been used, about 10 pounds from one container and 30 pounds from another. During the interview he mentioned that possibly a pilot light had been left burning during the fumigation. Later it was learned that the instructions for using methyl bromide gas require that all flames be extinguished prior to fumigation.

It was then discovered that about 2 years previously a similar incident had occurred in another southern California home, where a pilot light had been left on during methyl bromide fumigation. Most of the metal objects in that house had become corroded and had to be replaced. The residents there too had experienced skin and respiratory irritation.

In an attempt to identify the corrosive and irritating substance, the health department laboratory impregnated paper, wood, and metal with various forms of bromides to determine which bromide would cause corrosion. The laboratory tests indicated that hydrobromic

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acid was quite corrosive, and also that it was persistent as a residual material. Moreover, hydrobromic acid is a powerful irritant to the eyes, skin, and respiratory system, and it can be formed from methyl bromide by decomposition in a flame. Since hydrobromic acid can react with fabrics, wood, and metal to form bromides and methyl bromide cannot, it appeared that hydrobromic acid might be the cause of the distress. An investigation to ascertain the presence of residual bromides on surfaces within the house disclosed substantial quantities of bromides on the ceilings, walls, door frames, and other surfaces.

The sampling method consisted of wiping about 200 square inches of each surface with a folded industrial paper wiper which had previously been dampened in 1 percent sodium bicarbonate solution. The samples obtained were then analyzed for bromides by the phenol red colorimetric method of Houghton (7). The results of those wipe tests are shown in table 1.

Wipe samples were also obtained in two other homes where no pilot light had been left burning during fumigation. Bromide residuals found in the "control" homes are listed in table 2.

Definite quantities of residual bromides were present in the home where the pilot light was burning (table 1), while residual bromides were almost completely absent in homes where no pilot light was burning during fumigation (table 2).

Further inquiry elicited information about several other homes adversely affected after methyl bromide fumigation during which one or more flames had been left burning. In one

Table 1. Bromide residuals in home where pilot light was burning during fumigation

Location	Milligram of bromide per sample
Kitchen ceiling	0.37
Kitchen door frame	.75
Kitchen cabinets	.48
Bottom of kitchen table	.23
Ledge in kitchen	.34
Hall door frames	.74
Rear of hall picture	.39
Wall of living room	.37
Under house	.37

of these homes sufficient gas to keep a pilot light burning for hours was reported to have remained in the supply line even though the fuel gas supply service valve was shut off. Tests of wipe samples taken at two of these homes where fumigation had been completed 4 to 6 months previously show that bromides were still present (table 3).

After the surfaces of Mrs. G's house had been thoroughly washed, only two of five additional wipe samples contained any detectable amount of bromide. One sample contained only 0.01 and the other only 0.03 milligrams of bromide.

One other house in which pilot lights had been left on during a recent fumigation was located during the study. Shortly after the fumigation all surfaces in this house had been thoroughly washed. Five wipe samples were

Table 2. Bromide residuals in homes where pilot light was not burning during fumigation

Location	Milligram of bromide per sample
Home of Mrs. W:	
Attic at impregnation points	0.06
Rear of stove	.01
Under kitchen sink	0
Kitchen walls	.03
Bedroom surfaces	0
Home of Mrs. S:	
Hot water heater	0
Behind kitchen stove	0
Under kitchen sink	0
Inside kitchen cabinet	.01
Walls of den	0

Table 3. Bromide residuals found 4-6 months after fumigation in homes where pilot light was burning during fumigation¹

Location	Milligrams of bromide per sample
Home of Mrs. G:	
Underside of kitchen shelves	1.7
Vent over stove	1.8
Kitchen ceiling	1.8
Home of Mrs. P:	
Kitchen ceiling	.84
Kitchen vent	1.5
Top of hot water heater	2.2
Kitchen window frames	.8

¹ After fumigation some irritation of the hands was reported in both instances.

obtained for analysis, and none disclosed a detectable amount of bromide ion.

Discussion

From these results, it was concluded that bromides remaining after methyl bromide fumigation were removed by washing the surfaces thoroughly.

Under ordinary conditions of fumigation, 40 pounds of methyl provides a concentration of methyl bromide vapor in air of about 1.5 percent (15,000 ppm) in an average house (area, 1,250 square feet; volume, 10,000 cubic feet). According to Nuckolls (2) and von Oettingen (3), 0.7 percent by volume methyl bromide vapor in a room was decomposed by a gas flame to give 0.003 percent volume of hydrogen bromide. A 2.2 percent by volume methyl bromide was similarly decomposed to give 0.011 percent by volume hydrobromide.

Interpolation, assuming decomposition follows a straight-line function, indicates that a 1.5 percent concentration of methyl bromide under such circumstances would decompose to give 72 ppm (0.0072 percent by volume) of hydrogen bromide. (The threshold limit value for hydrogen bromide in air, according to the list for 1959 issued by the American Conference of Governmental Industrial Hygienists, is 5 ppm, or 0.0005 percent by volume.)

In view of von Oettingen's work, indicating the decomposition of methyl bromide by gas flame, and the results of this investigation, it seems probable that the methyl bromide used to fumigate the homes studied was decomposed by burning pilot lights. The decomposition was accompanied by formation of hydrogen bromide, which in turn produced the persistent

and irritating condition which was the basis for the complaints.

Recommendations

Since this explanation fits all the circumstances, it is believed to be correct. Therefore, it is recommended that a very careful effort be made to insure that all flames, including pilot lights, be extinguished before fumigating any residence with methyl bromide. There is little doubt that the presence of any open flame during methyl bromide fumigation will result in the irritating and distressing conditions.

If metallic objects such as stoves, hot water heaters, or floor furnaces appear corroded, or if any irritation is experienced following fumigation, it is inadvisable to occupy the house until it has been thoroughly decontaminated. All exposed surfaces and fabrics should be decontaminated by washing them with a mild alkaline solution, such as sodium carbonate (washing soda) dissolved in water. An alkaline solution will neutralize any residual hydrogen bromide.

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Epidemic Shigellosis in a Rural Area

F. J. SPENCER, M.B., B.S., M.P.H.

IN the 19 months from May 1957 through November 1958, three epidemics of gastroenteritis in a small city-county area in northern Virginia, with a total population of 27,000, were shown to have been caused by *Shigella*. In two of these outbreaks the organism was transmitted from person to person, while in the third it was foodborne. Shigellosis in epidemic form is unusual, and only 94 outbreaks were reported to the Public Health Service from 1951 through 1958 (1).

Foodborne Outbreak

One outbreak of shigellosis occurred in a women's college in the city in May 1957, at the end of the school year. Investigation was hampered by the rapid and wide dispersal of the students, but the 79 known patients were given questionnaires, and 75 of the students returned them, although several were incomplete. Questionnaires were also completed by 94 of 100 faculty members.

The time of onset of symptoms in 46 cases is shown in figure 1. The first symptoms were noted at 9 a.m. on May 23, and the last patient became ill at 11 a.m. on May 26, a range of 74 hours with a median at 11:30 p.m. on May 23. The four cases on May 25 and 26 may well have been secondary.

In most of the cases reported on in the questionnaires, the disease began with a headache, generally accompanied by a chill. These symptoms were followed in a few hours by diarrhea, most frequently with abdominal pain, and generalized aching (table 1). Blood was noted

in the stools of two patients. Maximum oral temperatures ranged from 98.4° F. to 104.2° F., with a median of 101.8° F., and most patients were afebrile within 48 hours. Prostration was marked, but only a few patients were in the college infirmary for more than 2 days. Three patients were readmitted, probably because they had been released prematurely to take their final examinations.

It is questionable whether the attack rate of 5.3 percent reflects the true incidence of disease among the 1,502 students, as random questioning of other students and college officials revealed that many students who were ill did not report to the college infirmary. Fecal specimens obtained from 13 patients yielded 9 cultures containing *Shigella flexneri*.

The distribution of cases pointed to a single common source. Contamination of water was ruled out by negative results of laboratory tests and absence of infection in faculty members, most of whom drank water daily on the campus. Sewage disposal facilities were adequate and in good repair. Milk was excluded because no cases of shigellosis occurred in other customers of the dairy supplying the college. Fly control was good. These findings eliminated every known possibility except a foodborne infection.

Inasmuch as 71 patients shared no common eating place outside the campus, attention was directed to the two eating facilities on the campus. These were the restaurant in the student activities building and the college dining hall. The restaurant was absolved when it was learned that none of the faculty members who ate there regularly was stricken and that seven patients had not eaten there since May 19. These seven patients stated that they had eaten only in the dining hall since that date. The

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investigation was therefore centered on the dining hall.

Generally, sanitation in the kitchen was good. A specimen of only one food, chicken à la king served on May 22, was available, and it yielded negative results. Accurate histories of gastrointestinal symptoms were difficult to obtain from kitchen personnel, although one cook's helper stated that he had had diarrhea on May 5, and three kitchen workers said that they had had diarrhea during the outbreak. All fecal samples and followup rectal swabs from the food handlers were negative. The source case was not discovered, the only pertinent history coming from the cook's helper.

One other finding may be relevant. The head student waitress had acute diarrhea on May 20 and spent half of that day in the college infirmary, where she was treated with kaopectate and aspirin. However, she served in the dining hall that day and the next. Her symptoms became more severe on May 23, and a fecal specimen on June 1 was positive for *S. flexneri*. As head waitress this girl could have contaminated a small portion of the food served, thus accounting for the relatively low attack rates.

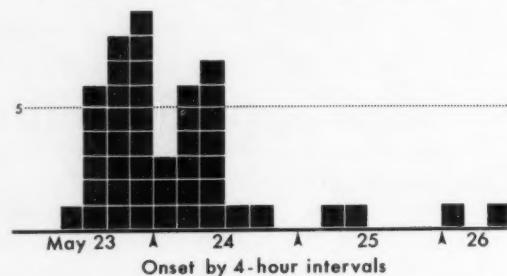
Adequate followup was impossible because the outbreak coincided with the departure of the students for their homes. However, a letter sent by the college physician to each known patient advised the student to be examined by her family physician. Fecal specimens were collected from all known patients who returned to college in the fall and examined by the State health department laboratory. One of these specimens was positive for *S. flexneri*.

It was suggested that in the future fecal specimens be submitted routinely from all patients with diarrhea treated at the college infir-

Table 1. Symptoms manifested by 72 patients in an outbreak of shigellosis at a women's college in Virginia, May 1957

Symptom	Number	Percent
Fever.....	71	98.6
Diarrhea.....	70	97.2
Headache.....	68	94.4
Abdominal pain.....	61	84.7
Chill.....	58	80.6
Vomiting.....	40	55.6
Generalized aching.....	36	50.0

Figure 1.
College outbreak of shigellosis, May 1957



mary. Reporting of illness of all food handlers, including student waitresses, was also recommended.

Person-to-Person Outbreaks

The first two cases in a rural outbreak in June 1957 were reported by a private physician after the patients were admitted to the hospital. An interview with the patients' family revealed that other members of that family (X) and two members of a neighboring family (Y) had similar symptoms at that time. A case probably related occurred in a third family (Z) living nearby, it was learned at a later date. The first onset of symptoms was noted by a member of family X on June 10, and the last onset by a member of family Z on June 27 (fig. 2). Symptoms were comparable to those experienced by patients in the college outbreak. Three fecal specimens positive for *Shigella sonnei* were obtained, two from family X and one from family Y.

Each family obtained its water supply from a shallow well which had inadequate physical protection. Sewage disposal facilities consisted of pit privies in reasonable repair. Flies were abundant in the privies and in the houses. Raw milk was obtained from the farm on which members of the three families worked, but no cases of shigellosis were reported in other families who used this raw milk supply. Other milk products were obtained from approved sources and no food which might have been the cause was disclosed.

There was no common source to explain this outbreak. The probable route of transmission was from family X to family Y by direct con-

tact aided by flies, and thence to family Z by flies.

The members of the families who worked in the dairy barn were kept from work until they each had three negative fecal specimens. One member of family X who worked in a cooky factory was not permitted to handle cookies until she had three negative fecal specimens. Other control measures were aimed at prevention of spread through the raw milk supply and in the schools, and general improvement in sanitation was urged. Boiling of raw milk used by the dairy workers was suggested. The children of the affected families were kept out of school until fecal specimens were examined. Privies were repaired as required by local ordinances, and recommendations were made for protection of the water supply.

Another rural outbreak occurred in 1958 and affected four families. Geographically and epidemiologically no connection was evident between this and the previous epidemics. The first case reported was in a 6-year-old boy who was kept out of school on November 11 with diarrhea. Subsequently, diarrhea developed in six other members of this child's family, and investigation revealed that members of three other families in the neighborhood also had diarrhea (fig. 3). *S. sonnei* was recovered from two members of one of these families and from six members of the first family. Symptoms were those of classic shigellosis; in six of the eight confirmed cases the patients had blood in their stools.

As in the previous rural outbreak, water was obtained from unprotected shallow wells. The pit privies used by the families were in poor repair, and flies were noted in large numbers in the houses and in the surrounding areas. Milk and milk products were obtained from ap-

Figure 2.

Rural outbreak of shigellosis, June 1957

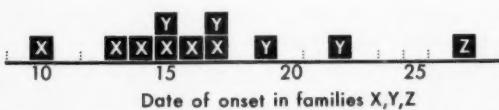
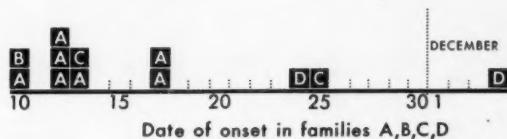


Figure 3.

Rural outbreak of shigellosis, November 1958



proved sources. No food history relevant to the outbreak was elicited.

The source of this outbreak was not revealed, but one possibility may be noted. A child who had been absent from school for 5 days with diarrhea and fever returned to school 2 days before the first child in family A developed dysentery. These children were in the same grade. No fecal specimens were obtained from the first of these children, and no other cases occurred in the school.

As in the rural outbreak which occurred in June 1957, control measures were aimed at preventing spread in the schools and in the local population. No members of any of these families worked with food or milk.

Discussion

These outbreaks indicate how easily an endemic reservoir of shigellosis may assume epidemic proportions. Studies made in Henrico County, Va., in 1931 by McGinnes and associates showed that a high percentage of rural families had shigellae in their stools (2). A similar survey by Watt and Hardy demonstrated that the problem was more marked in rural areas than in cities (3). Thus it is evident that endemic shigellosis is a problem of rural areas.

The endemic focus which produces localized person-to-person outbreaks may readily explode into a foodborne, milkborne, or waterborne epidemic. Despite modern therapy it is very likely that many patients with diarrhea retain *Shigella* in their intestines for a considerable time. As very few patients or contacts have fecal specimens examined, the true incidence of shigellosis, whether apparent or not, is difficult to ascertain. It is believed that further studies in an endemic-epidemic rural area would be beneficial.

Table 2. Reported number of cases and deaths for shigellosis and typhoid fever, United States, 1955-58

Year	Shigellosis			Typhoid fever		
	Cases	Deaths	Case fatality rate (percent)	Cases	Deaths	Case fatality rate (percent)
1955	13,912	187	1.3	1,704	34	2.0
1956	10,306	156	1.5	1,700	54	3.2
1957	9,822	156	1.6	1,231	34	2.8
1958	11,861	157	1.3	1,043	23	2.2

SOURCE: National Office of Vital Statistics, Public Health Service.

Shigellosis cannot be viewed with equanimity. It is serious and sometimes fatal in infancy, causing more deaths annually than typhoid fever (table 2). The downward trend evident in typhoid fever is not occurring in shigellosis. Detailed instructions are still issued on the followup of typhoid cases by health departments which almost completely ignore shigellosis. This emphasis, of course, reflects the traditional attitude toward the investigation of enteric disease.

Use of the public health laboratory by practicing physicians should be encouraged and local health departments should be alerted to follow up cases of shigellosis, particularly when infants may be exposed or a member of an infected family works with food, milk, or water. The third outbreak described in this paper was brought to light because an observant public health nurse had been indoctrinated in this way of thinking. Investigation of cases of shigellosis need not occupy much of a health department's time, and it is suggested that this should

be included in the overall program of disease prevention.

The basic approach to the problem in rural areas is to determine the endemic foci as shown in a study in Arizona (4). Until these endemic foci are determined, intelligent control can not be established (5). Knowledge of endemic conditions will prevent spread not only in local person-to-person outbreaks, but also in explosive common-source epidemics. The ecology of shigellosis is still largely a mystery, and an understanding of the geographic incidence of the disease would be an excellent starting point from which to move toward complete control.

Summary

Three epidemics of shigellosis, two person to person and one foodborne, occurred in a small city-county area in Virginia. These outbreaks indicate how easily the endemic reservoir of shigellosis may assume epidemic proportions. It is believed that further studies in an endemic-epidemic rural area would be beneficial.

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An Overview of Alcoholism Research

JAMES H. FOX, Ph.D.

ALCOHOLISM as a field of study is both fascinating and frustrating. Certainly it is little understood. Because alcoholism presents a challenge of tremendous complexity, its ultimate control will depend on the skills of diverse scientific disciplines. This paper reviews several of the contributions of various fields and indicates the nature of crucial research problems which will have to be solved if our understanding is to be increased. The intimate relation between alcoholism and the entire range of mental health problems is stressed throughout. Alcoholism research cannot be dissociated from other concerns about the mental health of our population.

The impetus for this research stems primarily from the fact that alcoholism has been defined as a social problem by the dominant cultural values of contemporary society in the United States. When a behavior pattern is defined as problematical, institutional resources are mobilized to deal with it. The resources, in turn, are guided by cultural values. A brief review of the dominant cultural values as they affect the definition of alcoholism will provide a useful point of departure for a consideration of current research efforts and needs.

Alcoholism as a social problem has undergone an interesting, although not unique, evolution. Not too long ago it was defined as a moral, religious, and ethical problem, especially within the middle class. The alcoholic was ridiculed, scorned, and held up as an example

of the danger of straying from the pronounced standard of conduct. The evil was thought to exist within the man; his only escape was through redemption. Simultaneously, however, another cultural value was prevalent. Each man was a free and independent agent who could exercise his "inherent" rights, including the right to drink, as long as he did not injure other persons or property. The opening of the western part of the continent, the general expansiveness of the 19th century, and the individualistic nature of Protestantism, all contributed to the furtherance of individual independence. That these two cultural values would clash was inevitable. There resulted a redefinition of the problem in legal terms.

Alcoholism from the legal standpoint was treated like other antisocial behavior problems. There was a demand for a law with teeth in it so that the problem could be effectively stamped out. The alcoholic was considered a weak-willed individual who was subjected to a force over which he had little, if any, control. He had to be protected by eliminating the source of the evil, the liquor industry. The evil was now outside the individual; his escape was removal of temptation. This legal solution to the problem failed, and with the repeal of the Eighteenth Amendment efforts at direct control at the national level were terminated. The problem was once again redefined, now as a sociomedical question.

Alcoholism has not been well defined in socio-medical terms, if indeed it has been defined at all. In general, alcoholism is considered an illness with a basis that is physiological or psychological or both. The evil is still within man. Now, however, it is no longer an evil but rather an illness. Man's escape is through

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intervention and prevention. Alcoholism becomes a legitimate field of study for the behavioral and medical sciences.

Ideally, alcoholism should be considered as neither good nor bad, but simply as an illness to be treated and hopefully cured, or at least arrested. Among professional people and the general public, however, value judgments of good and bad intrude. Lacking effective treatment techniques, the physician is confronted with an illness which entails endless frustrations and a generally poor prognosis. Alcoholism is a "bad" illness in terms of medical value judgments. For the general public, alcoholism differs from, let us say, cancer in the sense that the individual has little control over cancer's invasion, but presumably anyone can stop drinking if he really wants to. Or, an individual may catch a cold, but never will he "catch" alcoholism. Thus, even as an illness, alcoholism is not free from the controversy historically related to it.

It should not be inferred that the stages of evolution are discrete; alcoholism is considered today as a moral, legal, and sociomedical problem. The "drunk" somehow should be reformed, jailed, or cured. Apparently most professional workers accept alcoholism as a sociomedical problem; but this acceptance is not universal, as evidenced by the activities of some temperance groups and the filled "drunk tanks" in many local jails.

Defining the Problem

The picture of current alcoholism research has been deftly drawn by Dr. A. Querido, director of the Amsterdam Central Bureau of Public Health, The Netherlands, in the following analogy (1):

"We have witnessed the moral and ethical approach, the psychiatric and psychological, the economic, the sociological and the pharmacological approaches. In this way an enormous amount of knowledge has been gathered. The problem of alcoholism today may be compared to a mountain in which a great number of tunnels has been dug, each in its own direction and each bringing specific data to light concerning the nature of the rock of which the mountain is composed. Without denying the

value of these data, it must be admitted that the mountain still stands in its tremendous bulk, offering a serious impediment in our social traffic, and that as yet no way has been found to bypass it when building the highways of a healthy social life." Our concern is with exploring some of these tunnels. Needless to say, our explorations can be neither conclusive nor exhaustive.

There are two separate facets to man's problematic use of alcohol. One is concerned with the effects of alcohol on the organism. This is the problem of the harmful effects from intensive and prolonged ingestion of the drug alcohol. The second facet deals with the motivations for drinking alcohol. Here concern is directed toward understanding the reasons for using alcohol to cope with personal-social problems.

Related to these two facets are two levels of treatment. The first treats the harm done to the physical organism; the second is directed toward understanding the psychodynamics which lead to the choice of alcohol as a coping mechanism. Obviously, adequate treatment must proceed on both levels.

A perusal of the professional literature on alcoholism reveals two major areas of interest: the etiological, devoted to determining factors in the causation of the illness, and therapy, concerned primarily with the various types of treatment.

Etiology

In etiology, there are four major orientations, each reflecting the disciplines of the investigators: physiology, psychology, psychiatry, and sociology.

Physiological

Research on the effects of alcohol on the organism has been concerned with the absorption, oxidation, and elimination of alcohol by the organism. Alcohol is absorbed almost directly into the blood, and when it reaches the brain the physiological effects become obvious. Alcohol acts as a depressant and releases the inhibitions which individuals ordinarily have.

How much alcohol must be absorbed before its effects are felt? It is estimated that an in-

dividual can consume roughly one ounce of liquor per hour without experiencing any depressant effects. As the amount of alcohol consumed increases, the organism is less able to handle it. The result is a progressive deterioration of the body's ability to function, terminating in an unconscious stupor. Greenberg (2) has summarized the physiological effects of alcohol on the body in the following way:

"Habitual, heavy drinking produces—aside from its social, economic and moral havoc—serious and permanent bodily damage, mainly through nutritional deficiencies and metabolic disturbances. There is no evidence that small or moderate amounts of alcohol are harmful. By improving blood circulation to the body surface, a little alcohol can bring comfort to elderly patients. A small amount of alcohol increases the appetite and lessens tensions and irritations. It does not greatly affect normal blood pressure, but it does prevent the pressure from rising during anxiety. Alcohol certainly does not stimulate thought, but it may relieve worry. Undoubtedly it is because of this relief from environmental stresses and emotional tensions that the moderate use of alcohol has persisted."

Recent studies have been concerned with the metabolic characteristics of alcoholics. In general, these studies follow a research design wherein a group of alcoholics is compared with a group of nonalcoholics. One such study seems to indicate that alcoholics may suffer from impaired adrenal functions (3), and in another, it was determined that alcoholics have a higher copper concentration in the blood (4). These higher copper levels, the study suggests, are not solely the result of years of excessive alcohol consumption, but they may be an important predisposing factor to the disease.

The basic question these and many other physiological studies are attempting to answer is whether or not there is a physiological predisposition toward loss of control. In other words, is there an innate organic factor operating in some individuals causing them inevitably to become addicted when they drink alcohol and thus progress to the full development of the illness? At this time no physiologically predisposing factor has been isolated.

A related and also unanswered question pertains to the addictive characteristics of alcohol.

In certain respects, for example, the presence of withdrawal symptoms, it acts like an addictive drug. Yet it varies sufficiently so that many investigators are not willing to so classify it.

Psychological

Psychological research has paralleled physiological research. The typical research design compares a group of alcoholics with a group of nonalcoholic controls. Studies in this area range from administering psychophysical tests to the use of the various projective techniques. In the area of psychophysical tests the preponderance of evidence indicates that with the ingestion of alcohol the psychophysical reactions of the individual are impaired. With two or three drinks, blood alcohol levels rise to between 0.03 and 0.05 percent. Laboratory results show that even at these relatively low levels there is degradation of performance. Certainly if a large amount of alcohol is consumed, performance markedly deteriorates.

At the other end of the psychological testing continuum, alcoholics and nonalcoholics have been given Rorschach, Thematic Apperception, and Minnesota Multiphasic Personality Inventory Tests. No clear pattern of personality differences between the two groups has emerged from these efforts. If there is a particular personality type which is predisposed toward alcoholism, experiments and procedures have not yet been devised to demonstrate its existence.

Psychiatric

Among the explanations of alcoholism proposed by analysts are self-destruction, oral fixation, and latent homosexuality. The etiology of alcoholism is felt to be centered about one of these unconscious tendencies, or possibly a combination of them. The self-destructive urges are seen as results of feeling betrayed in childhood. The individual destroys the betrayer as well as the self through drinking to the point of unconsciousness. The oral fixation etiology is based on assumed early oral frustrations. The individual has passive and dependent urges and desires to use the mouth for oral gratification. Alcohol is chosen because of its ability to provide inner warmth, tranquility, and, ultimately, unconsciousness. As far as

homosexuality is concerned, alcoholism is viewed as a substitute for overt homosexuality.

Simmel (5), taking a somewhat different approach, differentiates among four classes of chronic drinkers: the social drinker, the reactive drinker, the neurotic drinker, and the alcohol addict. In the first two groups, social and reactive, alcohol is used as a defense against the impact of external circumstances. In the last two groups, neurotic and addict, alcohol is used to defend against the threat of inner, unconscious conflicts. Alcoholic euphoria is characterized as degenitalized sexuality, a major psychic economy for the neurotic. It has been described as a successful transformation of painful, infantile experiences into pleasurable feelings which reestablish the sensations once denied in infancy.

Sociological

The sociological approach to the study of alcoholism has not been especially concerned with etiology. Rather, emphasis has been placed on the gathering of descriptive data related to the problem. The population of alcoholics could be described in sociological terms as being older, unmarried men exhibiting a very high degree of occupational mobility. There are, of course, other types of individuals who are alcoholics, and not all individuals who possess these characteristics are alcoholics. However, this description represents the largest proportion of alcoholics. Some sociological studies (6,7) have been concerned with the drinking patterns in high schools and colleges; others (8) with motivational factors in drinking, that is, with the question, why do people drink? Still other studies have been concerned with the significance and importance of ethnic and religious affiliations. As is well known, the Irish have an unusually high alcoholism rate, while the Jews have an unusually low rate. Yet in both groups exposure to alcohol drinking is a recognized part of the socialization process. In spite of several rather intensive analyses of these variant patterns, no definitive statement can yet be made which explains the observed differences. Consideration has been given to the meaning which alcohol has within each group; pressures conducive to drinking to the

point of intoxication within the Irish group have been noted. Likewise, those pressures within the Jewish group which tend to prevent intoxication have been pointed out.

Therapy

There are three major therapeutic activities involved in the effort to arrest alcoholism. These are pharmacological, psychotherapeutic, and Alcoholics Anonymous.

Pharmacological

Pharmacological therapy may include the use of different types of drugs, for example, Antabuse or an emetic such as emetine hydrochloride. The general effectiveness of the various drugs is highly uncertain. Yet it appears that each is useful for some individuals. An interesting experiment designed to test the efficacy of four different types of therapy is reported by Wallerstein (9). The four therapeutic techniques were Antabuse, conditioned reflex, group hypnotherapy, and, finally, milieu therapy. Antabuse was used with the first group. The conditioned reflex treatment consisted of an emetic. Hypnotherapy and post-hypnotic suggestion were used with the third group. The milieu therapy participants originally were to be controls. Their participation in the experiment, however, seemed to cause them to behave differently from the typical alcoholic patient on the ward. For example, they requested 2 hours of group therapy each week, while other treatment groups had but one session weekly. The results of the study indicated that Antabuse was somewhat more effective than the other types of treatment considered.

Psychotherapeutic

Psychotherapy of various forms is for some alcoholics an effective therapeutic mechanism. The skills used in treating alcoholics do not vary from those skills used in treating other individuals. It must be admitted, however, that alcoholics frequently resist the best efforts of the therapist. The psychotherapeutic approach varies most from the other therapies in recognizing that alcoholism may be only symp-

tomatic of deeper underlying disturbances. The therapeutic effort therefore focuses on ameliorating the underlying causes of the overt excessive drinking behavior.

Alcoholics Anonymous

Certainly, Alcoholics Anonymous has enjoyed great success in assisting individuals to maintain sobriety. All the reasons for the success of its program are not known, not even by its members. Some of the factors probably related to the success of the organization are: (a) mutual understanding and acceptance, (b) supportive and reinforcement activities designed to aid another in remaining sober, (c) group identification and affiliation which provide for goals outside the self, (d) continuing rededication to the ideals and goals through regular group sessions, (e) opportunities for continual contrasts with previous states of insobriety, (f) opportunities to assist others achieve a meaningful status within the society, and (g) I would suspect at a deeper level, a subtle type of social-self reincarnation. Whatever the reasons may be, AA is generally successful. However, there are individuals who do not or cannot respond to this type of therapy. Perhaps at some future time studies will be designed to determine the selective factors which are operating in the therapeutic process.

While each of these three approaches makes a significant therapeutic effort, in actual practice, some individuals suffering from alcoholism are likely to be involved simultaneously with all of them. Other alcoholics may be exposed to only one of the approaches. The best prognosis most likely can be made when the needs of the individual are aligned with the most relevant therapeutic technique.

There is another phenomenon, spontaneous recovery, which occurs occasionally. How frequently this happens is not known. If it does occur often, the problem of evaluating any therapeutic effort becomes exceedingly difficult.

These, then, are some of the tunnels in our mountain. We have explored the tunnels, but the mountain remains. Perhaps a brief discussion of the inadequacies of the various research designs will enable us to appreciate the difficulties of attempting to determine primary

etiological factors and effective therapeutic techniques.

Research Problems

One of the traditional methods for measuring the extent of alcoholism in a given area is to use Jellinek's formula. This formula is based on an assumed relationship between the number of individuals who have died from cirrhosis of the liver and the number of individuals who are alcoholics. Until recently, rough measures of the extent of alcoholism have been predicted through use of this formula. Recently, however, workers in the field of alcoholism have been challenging its validity, having shown that the Jellinek formula probably underestimates the number (10-12). As a result of the present state of uncertainty, a statement to the effect that we just don't know how many alcoholics there are in the United States today is probably the only realistic and true statement which could be made.

A problem intimately associated with that of measurement pertains to definitions. Certainly if a phenomenon is to be measured, it must necessarily be defined, and it must be defined precisely enough to enable the mensuration process to occur. One of the generally accepted definitions of alcoholism can be used to demonstrate the difficulties. According to Keller and Seeley (13), alcoholism is "a chronic disease, or disorder of behaviour, characterized by the repeated drinking of alcoholic beverages to an extent that exceeds customary dietary use or ordinary compliance with the social drinking customs of the community, and that interferes with the drinker's health, interpersonal relations or economic functioning." While this definition may serve many useful purposes, it is of limited value for research and diagnostic purposes. More questions are raised than are answered, questions such as: What is excessive repeated drinking? What are the dietary and social drinking customs? Which community? Presumably, a person who drinks more (frequency or amount?) than others in his community would fit part of the definition. However, would the bridge club member who has two cocktails before dinner while the other members

have only one be considered an alcoholic? Conversely, would the individual who "drinks his breakfast" along with his fellow inhabitants of skid row be drinking in excess of the skid row community's customary dietary and social uses?

Another part of the definition can be applied more readily. Individuals whose health has begun to deteriorate or who have lost jobs because of drinking alcohol may be suffering from alcoholism. Another facet of the definition, "interferes with interpersonal relations," is much more ambiguous. Would the man who repeatedly has a cocktail before dinner over the strenuous objections of his wife be considered an alcoholic? It would appear that this definition lacks the precision necessary for research or clinical work. In fact, the shorter statement, "He drinks too much!" may be just as helpful.

The inadequacy of this definition and others for purposes of research is at least tacitly recognized by those working in the field. Reliance is usually placed on an operational definition; that is, it is stated for purposes of a given study that an individual who must have a "morning drink" is to be considered an alcoholic, or an individual who has suffered two or three black-outs will, for purposes of this study, be considered an alcoholic. While this is a satisfactory procedure for a particular study, it does present problems when one attempts to compare several studies if alcoholism is defined in various ways.

The difficulties in defining alcoholism have their roots in the controversy discussed earlier. For example, if a man drinks "too much" he is probably an alcoholic; if he beats his wife too, he surely is! Now he is an alcoholic because he drinks and beats his wife. The latter event is the confirming evidence. The quarrel here is not with the fact that alcohol, acting as a depressant, releases inhibitions, but rather with attributing such behavior to alcoholism instead of viewing drinking as a concomitant of the breakdown of interpersonal relations.

Directly related to the problem of definitions is that of communication. Certainly if individuals are to communicate in an effective way, it is imperative that the same meanings be placed upon the symbols which are used. However, among both the professional and lay groups interested in alcoholism, the confusion emanating

from inaccurate or inappropriate definitions is manifest. A review of the professional literature reveals that in many alcoholism studies groups of alcoholics are studied. Unfortunately, however, the criteria used to designate the category "alcoholic" are seldom presented. Under these circumstances, communication among professional people is effectively blocked. Barriers to communication among lay groups have already been touched upon.

Another problem relating to both the inadequate definitions and the breakdown in communication is the relative lack of knowledge pertaining to normal or nonpathological drinking patterns. In other words, we do not have appropriate baseline data with which suspected deviation in drinking habits can be compared. It is true that there are several national polls which provide some information and, in addition, a series of studies confined to particular population groups. However, these do not provide all the information necessary. There is need for communitywide studies on why people drink. Certainly if there are deviant motivations for drinking, for example, drinking to cope with difficult problems, then knowledge of these deviant reasons or motivations for drinking would become an important element in both intervention and prevention.

In a technical sense, one of the major shortcomings of the physiological and psychological research efforts is that the alcoholic group, however this group is defined, is usually composed of individuals who are in the advanced stages of the illness. Therefore, it becomes an exceedingly difficult, if not impossible, task to separate cause from effect. Any physiological or psychological differences from the control group of normals which might be noted could as well be the result of long exposure to alcohol as they could be causative factors. To be more specific, if it is found that alcoholics have a unique personality structure, or that alcoholics metabolize alcohol differently from nonalcoholics, one could not say that either of these conditions was a predisposing factor. It is conceivable that long exposure to alcohol could cause either one. One of the most obvious research needs in the field of alcoholism is therefore a series of long-range studies. One such study has recently been reported (14).

In 1935 two groups of boys, one judged as maladjusted and the other judged as normal, were subjected to intensive investigation. Some of the boys were given special attention, such as social counseling and medical and educational aid. The remainder were left to the regular community assistance programs. In 1956, 21 years later, a followup study investigated the relationship between the adult lives of the boys and their childhood. Included was a study of alcoholism within the group.

Because of the earlier intensive investigation and the more recent one, it became possible to subject several current theories of alcoholism to critical review based on the analyses of these data. Physiological theories of nutritional deficiency, glandular disorder, and heredity were subjected to tests. It was determined that metabolic disturbances are not significantly related to alcoholism, that glandular disorder does not lead to alcoholism, and evidence for a hereditary explanation is lacking. In much the same manner, several of the analytical theories were tested. Suicidal, oral, and homosexual tendencies were investigated. In these analyses it was suggested that boys with marked suicidal tendencies may be more likely to become addicted. On the other hand, boys who had oral tendencies or who were markedly feminine did not have a greater tendency to alcoholism.

Interestingly enough, it was also found that boys whose mothers strongly encouraged dependency were not more likely than other boys to become alcoholics. In much the same manner, it was suggested that boys with strong inferiority feelings were not more likely to become alcoholics. There are certain problems with this study, for example, the measures of physiological malfunction used 21 years ago were not so precise as those in contemporary use. However, in spite of shortcomings of this kind, the study is significant in that it is one of the few efforts to gather longitudinal data.

Little research has been done on the effectiveness of the various types of therapeutic effort. Not too much is known except that some kinds of therapy work for some kinds of people. However, basic questions, such as what types of individuals are most likely to benefit

from amongst the various therapeutic techniques, remain unanswered. Certainly there is need for evaluations of the various means of intervention.

The Federal Program

The National Institute of Mental Health, Public Health Service, through its own research and through its grants program, actively seeks solutions to the problems raised. Various kinds of support are provided for investigators working in many of the tunnels in our mountain. For example, support is given to the North American Association of Alcoholism Programs in a nomenclature study which was recently inaugurated. The purpose of this study is to derive an acceptable definition of alcoholism, probably with some conformity to the American Medical Association's standard nomenclature. In another area, a major epidemiological study has come into existence. It is anticipated that this study will provide many of the baseline data on non-pathological drinking patterns which are so urgently needed. A major effort currently in its formative stage is the establishment of a Cooperative Commission on Alcoholism under the executive direction of Dr. Nevitt Sanford of the Center for Advanced Study in the Behavioral Sciences in Stanford, Calif. The commission will evaluate the existing state of knowledge, examine various therapeutic techniques, and make recommendations.

In addition to these research activities, the institute is supporting training and providing consultative and technical assistance to the States and organizations which are attempting to strengthen or increase our understanding of alcoholism. Perhaps it should be noted too that many of the projects supported by the institute may appear at first sight not to have any direct bearing upon the problem of alcoholism. However, it is quite likely that indirectly many of these projects will contribute to our knowledge in this very, very complex field (15).

Other agencies of the Department of Health, Education, and Welfare are also concerned with alcoholism. For example, the Office of Vocational Rehabilitation engages in extensive rehabilitation programs, including those for

the mentally ill. The Office of Education, too, is concerned with mental health in the schools, and with problems relating to health education.

While it may seem that in this paper more questions have been raised than have been answered, it would be erroneous to assume that no progress has been made in our understanding of alcoholism. As a result of the research we now know some of the questions to ask, and we are therefore in a position to develop ways of answering them.

The mountain still stands in its tremendous bulk. However, it is not an isolated mountain, but rather one of a range of problems. In fact, mental illness can be considered as the entire mountain range. In this regard it is at least conceivable that based on adequate research in the mental health field, much of the mountain chain may be bypassed on the road to health. Scaling or tunneling individual peaks may not be the surest way to reach our objective. Again, the alcoholism problem is one mountain among the very many mental health problem mountains which provide tremendous barriers to mentally healthy living.

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Community Oriented Services of Psychiatric Clinics, 1958

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DIAGNOSIS, therapy, and other direct services to patients with mental and emotional disorders are only one phase of the functions of mental health clinics. Clinics assist in the professional training of psychiatric and other mental health personnel and conduct research and evaluation studies. They also attempt to reach the total population by engaging in a wide variety of community-oriented activities concerned with preventing mental illness and promoting mental health in the community (1). In these community-oriented activities, clinic staffs provide professional assistance and consultation to various community agencies, aid in the mental health education of other professional and lay groups, and take part in interagency meetings and conferences for community planning and coordination.

Earlier publications describe the outpatient psychiatric clinics in the United States (2,3) and the direct services they provide to patients (4). These publications are based on data collected in a national reporting program for governmental and nongovernmental outpatient psychiatric clinics, a program established in 1954 by the National Institute of Mental Health, Public Health Service, in cooperation with the State mental health authorities (5). As a practical first step, reporting is limited to outpatient mental health clinics where an attending psychiatrist, with regularly scheduled hours, takes the medical responsibility for all clinic patients.

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For national reporting, community mental health service activities are classified by primary purpose into the following general groups: (a) information and education services for the general public, (b) inservice training for professional groups, (c) consultations and conferences with personnel of other agencies concerning emotional problems of individuals served by the agency as well as general mental health problems, and (d) participation in community mental health planning and coordination.

Clinics report the number of man-hours, including preparation and travel time, that professional staffs spend in each activity during April, the sample month. These hours, related to estimated total scheduled professional man-hours during the month, provide a measure of the relative effort placed on this particular clinic service.

This report summarizes information on community service activities during April 1958 reported by 595, or 43 percent, of the 1,386 outpatient psychiatric clinics in the United States. Table 1 shows the number of reporting clinics by State. Since information is collected for only 1 month of the year, and since the clinics which report are not a probability sample of all clinics, the data cannot measure the total clinic community service program. Nevertheless, the data suggest the emphasis placed on each aspect of community services by a large number of mental health clinics.

Clinic Staff Time in Community Services

The data available for April 1958 suggest that outpatient psychiatric clinics, regardless

of hours open, groups served, or agency operating the clinic, typically devote a relatively small proportion of time to community-oriented activities. Six percent of the estimated scheduled staff hours (23,000 out of 413,000 professional man-hours) were used for community services. Clinic staff members also spent an additional 6,000 hours of their own time after clinic hours for lectures or other community service as part of the clinic's program. This additional time represents about 20 percent of all reported community service hours.

Unpublished data reported by 419 clinics in the first reporting year (1954) and preliminary figures for 1959 for almost 800 clinics show the same proportion of hours in community services (6 percent).

Approximately three-fourths of the 595 clinics in 1958 reported either no time or less than 10 percent of their scheduled man-hours used for community services in April (table 2).

For the median clinic, the percentage is 4.2. Of 71 clinics that reported no regular clinic hours for these services, 29 indicated such activities after hours while others may have participated in other months. Only 8 clinics reported at least half of all scheduled staff hours in community services.

No detailed comparisons of community services are made by type of mental health clinic. The 1958 data suggest, however, that those most likely to participate in such services are full-time clinics, those with a multidisciplinary team (that is, a psychiatrist, psychologist, and psychiatric social worker), clinics that serve more children than adults, and those with relatively large caseloads.

Types of Community Service Activities

During April 1958, the principal clinic community service effort in terms of man-hours was directed toward supplementing the skills of

Table 1. Total number of outpatient psychiatric clinics and number reporting man-hours in community service activities, by State, April 1958

State	Number of clinics		State	Number of clinics	
	Total	Reporting		Total	Reporting
Total	1,386	595	Nevada	4	4
Alabama	9	8	New Hampshire	26	22
Arizona	5	1	New Jersey	61	0
Arkansas	3	2	New Mexico	1	0
California	79	56	New York	307	0
Colorado	17	11	North Carolina	14	12
Connecticut	40	0	North Dakota	1	1
Delaware	7	5	Ohio	54	35
District of Columbia	18	14	Oklahoma	5	1
Florida	26	23	Oregon	15	11
Georgia	11	5	Pennsylvania	100	21
Idaho	1	1	Rhode Island	9	8
Illinois	83	77	South Carolina	6	5
Indiana	18	16	South Dakota	3	2
Iowa	16	12	Tennessee	10	10
Kansas	23	0	Texas	27	14
Kentucky	20	14	Utah	5	4
Louisiana	21	15	Vermont	7	7
Maine	8	6	Virginia	24	21
Maryland	44	14	Washington	10	8
Massachusetts	89	25	West Virginia	8	6
Michigan	55	33	Wisconsin	22	17
Minnesota	13	11	Wyoming	0	0
Mississippi	3	0	Alaska	5	5
Missouri	29	15	Hawaii	8	5
Montana	4	4	Puerto Rico	2	1
Nebraska	9	6	Virgin Islands	1	1

Table 2. Distribution of 595 outpatient psychiatric clinics according to proportion of scheduled professional man-hours spent in community service activities, April 1958

Community service hours per 100 estimated total scheduled man-hours	Number of clinics	Percent
Total	595	100.0
None	71	11.9
Less than 1	39	6.6
1	38	6.4
2	76	12.8
3	64	10.8
4	52	8.7
5-9	129	21.7
10-14	54	9.1
15-19	27	4.5
20-29	28	4.7
30-49	9	1.5
50-69	8	1.3
Median		4.2

¹ Includes 29 clinics reporting no community services during scheduled hours but some services after hours.

various other professional groups in their handling of problems of mental disturbance (table 3). The clinics' professional staffs provide this service through consultations or conferences with agencies and by participation in the inservice training programs for other professionals.

Consultations and conferences with agencies about individuals who are agency cases but not clinic patients, or about general problems for which the agency requested help and advice, account for the largest proportion (about one-third) of clinic professional man-hours in community service activities. Schools use these consultation services more than other agencies. Social agencies and health agencies (including physicians) rank next. Consultations with correctional agencies (courts, probation officers, and police) and with all other groups (such as clergy, employers, and unions) take relatively little of clinic staff time.

Clinics participate in the inservice training programs for professionals of other agencies who "are in a strategic position to foster the mental health of the people they serve" (6). Planning or conducting these discussions, lectures, or seminars accounts for 23 percent of the clinic man-hours in community services.

About half of this time (11 percent) is used for training health personnel, usually physicians and nurses. Inservice programs for personnel of schools account for 4 percent, for social agencies 5 percent, and for correctional agency personnel, less than 1 percent.

Almost 30 percent of community service time is used for mental health information and education services to the general public. More than two-fifths of this time is spent in one-time presentations or lectures to the public and to

Table 3. Percent distribution of total professional man-hours of community service activities, according to type of activity during or after clinic day, 553 outpatient psychiatric clinics, April 1958¹

Type of activity	Total	During clinic day	After clinic day
Total man-hours of community service	29,006	22,876	6,130
Consultations and conferences with other agencies	34.1	39.0	15.9
Schools	10.8	13.0	2.5
Courts, probation officers, police	4.0	4.7	1.4
Social and welfare agencies	8.1	9.2	3.9
Health agencies (including private physicians)	7.4	8.4	3.7
Other agencies	3.8	3.7	4.4
Inservice training for professional groups	22.6	25.7	11.2
School personnel	3.6	3.7	2.9
Courts, probation officers, police	.6	.6	.7
Social and welfare personnel	4.6	5.3	2.2
Health personnel	11.2	13.1	4.4
Others	2.6	3.0	1.0
Information and education services, general public	27.5	21.9	48.3
Single presentation	11.8	6.6	31.4
Group study:			
Intensive limited period	.4.8	4.9	4.4
Periodic sessions, over longer period	1.8	1.3	3.6
Mass media	3.2	2.7	4.9
Visitors, general public	5.9	6.4	4.6
Participation in community planning and coordination	15.7	13.4	24.6

¹ Excludes 42 reporting clinics with no community service activities in April.

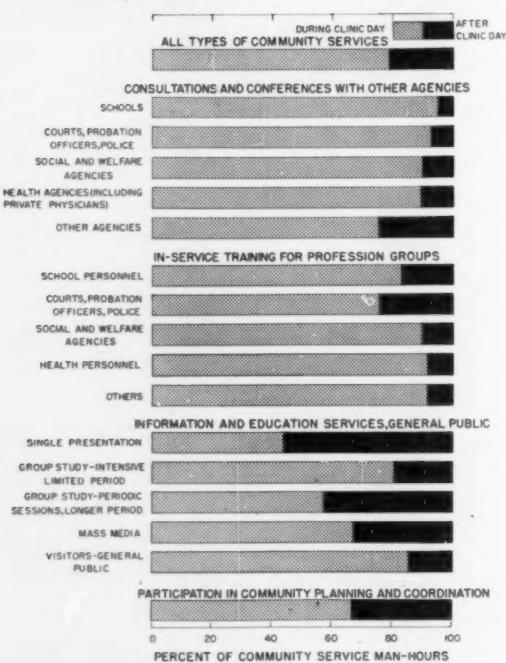
student groups; the remaining three-fifths is spent in leading group discussions, providing information to lay and professional visitors, and preparing public education items for radio, television, and other mass media.

The fourth major community service, participation in community planning and coordination, which includes such activities as working with interagency committees, conducting local mental health surveys, and promoting local mental health resources, accounts for only about 15 percent of the total time in community service activities.

After clinic hours, the principal community service activity consists of preparing talks and presenting them to the public. More than half of the time devoted to this type of activity is given after clinic hours (fig. 1).

Most clinics engage in more than one type of community service activity (table 4). Less

Figure 1. Percent of total community service man-hours spent during and after the clinic day, for each selected type of community service activity, 553 outpatient psychiatric clinics, April 1958¹



¹ Excludes 42 clinics with no community service activities in April.

than 10 percent of 553 clinics participate in only one of the four major groups of services; 35 percent participate in some aspects of each of the four types.

The emphasis on consultation is illustrated by the large proportion of clinics reporting this service. Of the 553 clinics, 88 percent consult

Table 4. Distribution of 553 outpatient psychiatric clinics according to the number engaged in one or more types of community service activities and the number engaged in each selected activity, April 1958¹

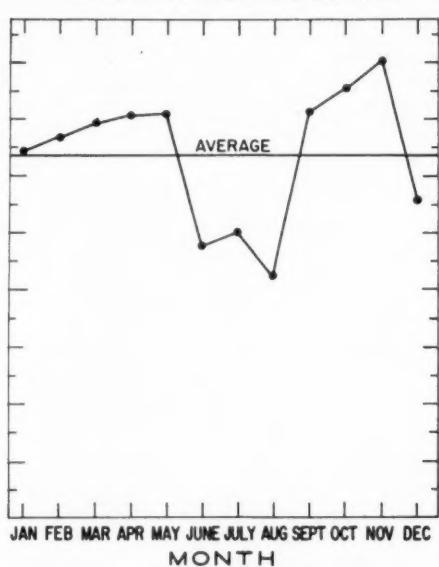
Type of activity	Number of clinics	Percent
Total	553	100.0
<i>Number of major types</i>		
One	52	9.4
Two	131	23.7
Three	175	31.6
Four	195	35.3
<i>Specified type</i>		
Consultations and conferences with other agencies	² 486	² 87.9
Schools	328	59.3
Courts, probation officers, police	268	48.5
Social and welfare agencies	374	67.6
Health agencies (including private physicians)	306	55.3
Other agencies	196	35.4
Inservice training for professional groups	² 346	² 62.6
School personnel	130	23.5
Courts, probation officers, police	46	8.3
Social and welfare personnel	136	24.6
Health personnel (physicians, nurses, etc.)	231	41.8
Others (clergy, etc.)	113	20.4
Information and education services for general public	² 461	² 83.4
Single presentation (lectures, talks)	413	74.7
Group study:		
Intensive limited period (workshop, institute)	106	19.2
Periodic sessions, over longer period	73	13.2
Mass media (radio, television, newspapers, pamphlets)	165	29.8
Visitors, general public	229	41.4
Participation in community planning and coordination	329	59.5

¹ Excludes 42 clinics with no community service activities in April.

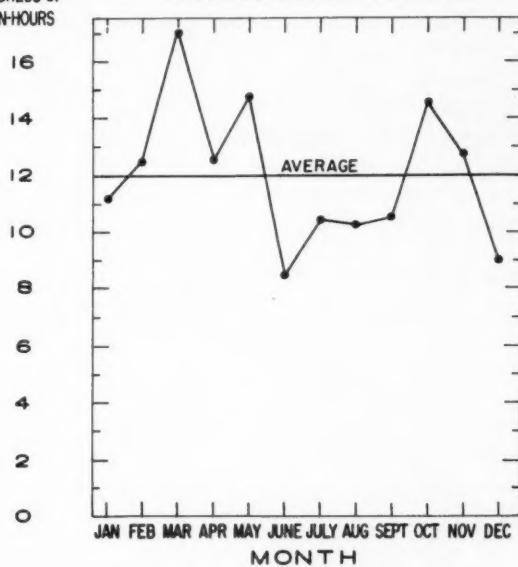
² The sum of the sub-items is greater than the figure shown for each major type of service because most clinics reported participation in more than one type.

Figure 2. Total professional man-hours in selected types of community service activities, by month and average for year, 101 reporting outpatient psychiatric clinics, 1956

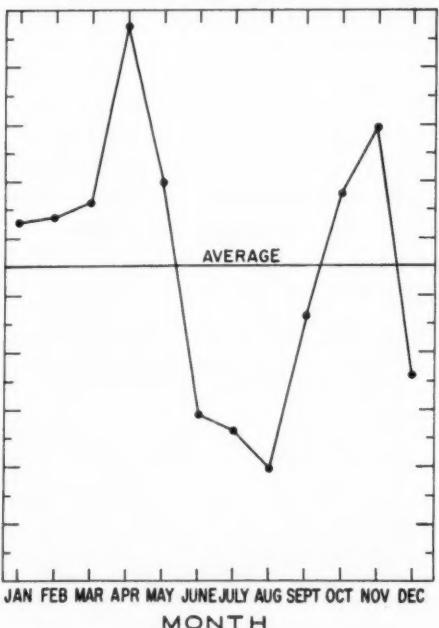
**CONSULTATIONS AND CONFERENCES
WITH OTHER AGENCIES**



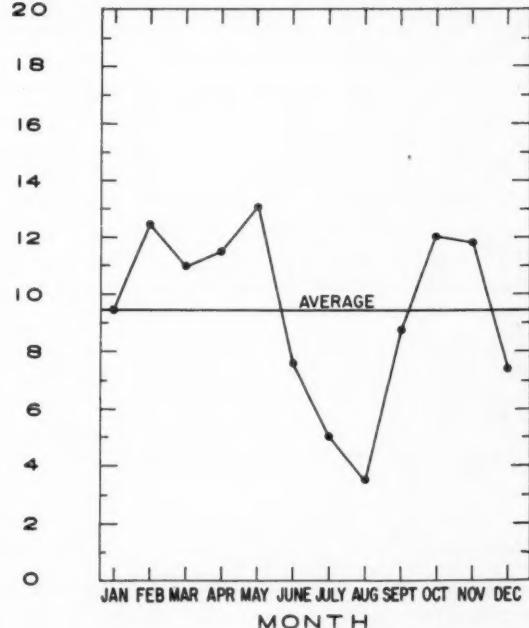
**IN-SERVICE TRAINING FOR
PROFESSIONAL GROUPS**



**INFORMATION AND EDUCATION SERVICES
FOR THE GENERAL PUBLIC**



**PARTICIPATION IN COMMUNITY
PLANNING AND COORDINATION**



or confer with other agencies, 68 percent with social agencies, 59 percent with schools, and 55 percent with health agencies. Participation in inservice training programs for other professional personnel is an activity of 63 percent of the clinics. In contrast with the consultation service they provide, relatively few clinics participate in the inservice training program for several professions. About 83 percent of the clinics provide information and education services for the general public, most frequently through lectures and talks. Sixty percent of the clinics participate in community planning.

Seasonal Variation in Community Services

A special report from 101 clinics on community service activities for each month in 1956 indicates that time spent varies markedly during the year (fig. 2). School sessions, vacation periods, and holidays seasons, in particular, appear to affect these activities. Generally, peak seasons for all types of activities are spring and fall, with minimum activity in the summer months. Consultations and conferences and inservice training activities have the least seasonal variation.

Three-fifths of the clinics report peak activity in one of four months (April, May, October, or November), but a few clinics report summer months as their most active. Activities during April, the sample month for annual reporting, generally account for about one-tenth of all community service hours during the year. Because of the sharp drop in information and education services for the general public in the summer months, however, 15 percent of the yearly total hours for these activities are in April. Both the percentage of staff hours for community service activities and the distribution of these hours by type of activity are similar for April 1956 and April 1958. This suggests that community service hours reported for April 1958 may also represent approximately 10 percent of the total community service hours for the year.

Discussion

Reports from 43 percent of all outpatient psychiatric clinics in the United States for a sample month, April 1958, indicate that 6 per-

cent of clinic staff time is used for the promotion of mental health in the entire community. For the clinics that have reported to date, there is little evidence of any change in the proportion of clinic time spent in this activity during the period 1954-59.

Reporting by a larger proportion of all outpatient psychiatric clinics in subsequent years will make possible more detailed analyses by type and location of clinics. In addition, reporting of community service hours during each month of the year will provide a more comprehensive picture of community service activities generally, as well as a more accurate measure of activities for any one clinic. Reporting for each month is being considered because of the seasonal variations in community service activities.

Several research areas may be suggested for further study of community service activities. The present data measure the amount of community services clinics provide. However, data are not available on community agency demands for such services and the extent to which these demands are being met. The need for training clinic professional personnel to promote and carry out community activities might also be surveyed. Adequate tools must be developed for evaluating the quality and effectiveness of community services. Thus, more detailed reporting with respect to the content and goals of consultation and education activities and some measure of the accomplishment toward these goals might be desirable in expanded data collection in this area.

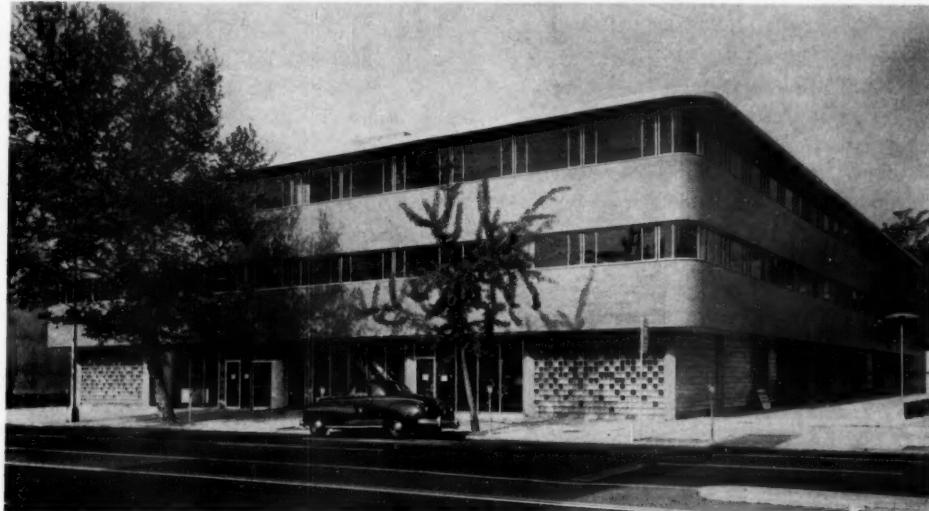
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Philadelphia's Community Health Services Building

THE CONCEPT of providing neighborhood centers for health services is sound—for health is too personal, too individualized to be forced into any one mold. Health services offered by a community center like this become a part of each citizen's life and habits; not some-

thing strange, apart, and threatening to be used only in an emergency. Washington, Harrisburg, and city hall—all may help provide those health benefits; but the closer to home they can be housed, the more they will be utilized and appreciated.

—BERWYN F. MATTISON, M.D., executive director, *American Public Health Association*, dedicating the *Community Health Services Building*, Philadelphia.

Relation of Nucleic Acid to Malignancy

"Beware, lest in feeding the stream, thou driest up the spring." These wise words appeared 350 years ago in one of the essays of Francis Bacon, Viscount St. Alban, Lord Chancellor of England under James I. This great statesman and philosopher foresaw in broad outline the tremendous role that scientific research and knowledge would come to play in the strength of nations, the welfare of populations, and the profits of corporations.

It is interesting to examine the ways in which the principles enunciated by Francis Bacon have found application and fruition in the cancer field. Through the greater part of the history of mankind malignant disease has posed a hopeless problem for those stricken by it and for physicians charged with their care. Two great discoveries, however, have served as springs from which healing streams have carried hope to the hopeless. The first of these great discoveries was made more than 120 years ago by two German biologists, Schleiden and Schwann, who recognized that all living creatures were comprised of units called cells. . . . Within a decade the importance of these discoveries to diseases was trumpeted forth by a brilliant young German pathologist, Rudolph Virchow, who, in 1848, at the age of 27, boldly announced his recognition of the principle that disease processes involved the cells which had been discovered a few years before and that malignant disease was characterized by abnormal growth and multiplication of cells in the body.

The realization of this simple truth opened up the most effective approach to treatment of malignant disease which is available to us at the present time. Successful cures depend on the removal or the killing of all the cells which have undergone malignant change in an individual afflicted with this disease. . . .

There has been a steady improvement in the effectiveness of treatment, so that a disease which was once hopeless for all stricken with it can now be handled with effective cures for a certain portion of the affected, all too small, we know, but happily growing as our knowledge and skills increase. More than a century after the initial breakthrough discoveries, we are still developing applications of this knowledge.

A second and equally crucial breakthrough dis-

covey, in my view, can be attributed to Dr. Avery and his associates at the Rockefeller Institute, who in 1945 demonstrated that nucleic acids affect the genetic characteristics of cells. To be sure, these people were working on bacterial cells. Malignancy may have been far from their minds. Yet the principles which they unearthed are, we now know, applicable to all cells. We know that healthy and malignant cells contain within them types of large molecules which scientists call nucleic acids. These may occur in the form of long molecular chains. We now realize that the pattern of the atoms in these nucleic acid chains provides a set of instructions which the cell follows in its activities. Small or large alterations in the atomic arrangements in these chains may provide the cell with altered instructions which, in some cases, may lead to malignancy and be transmitted to the offspring of such a cell. Thus an important clue to malignant disease, we feel sure, must reside in the nucleic acid content of the cells.

We are in the very early phases of the development of knowledge which will permit this important spring to flow into a stream which will power additional weapons for the management and prevention of malignant disease. Just as we are still refining applications of Schleiden and Schwann's cell theory more than a century after its discovery, so we can be sure that many decades will be consumed in developing the applications of Dr. Avery's discovery in the cancer field.

But we have need for more springs of fundamental discoveries which may provide us with decisive breakthroughs in the cancer problem. We have need to create and strengthen many streams which will develop the knowledge derived from these discoveries as they can be applied to the special problems of malignant disease. And finally we need the trained physicians, the equipment, the hospitals, and the specific knowledge which will permit these discoveries and their refinements to be applied individually for the benefit of patients and for the prevention of malignant disease in the population as a whole.—*Remarks of Dr. H. Stanley Bennett, dean of the division of the biological sciences of the University of Chicago, before the Board of Trustees of the University of Chicago Cancer Research Foundation, December 1960.*

Location and Outpatient Psychiatric Care

ALLEN HODGES, Ph.D., and HERBERT DÖRKEN, Ph.D.

IN 1954-55, 93 percent of the professional services in Minnesota's outpatient psychiatric clinics were concentrated in metropolitan areas, and only 7 percent were provided for the 55.7 percent of the State's population residing in nonmetropolitan areas (1). Today, less than 3 years after passage of the Minnesota Community Mental Health Services Act of 1957, outpatient psychiatric care is available to 45 percent of all State residents within their own communities. As provided in the act, more than half of Minnesota's 87 counties have received State grants-in-aid to establish local mental health centers (2-4).

In the evolving Minnesota community mental health program, 12 rural mental health centers serving 45 counties have been approved for State grants-in-aid. These centers serve populations ranging from approximately 116,000 to slightly less than 50,000 residents, and 10 are multicounty units serving from three to eight counties. The distance by road from a center to the farthest village within its service area ranges from 21 to 129 miles, with 47 miles the median distance.

These facts illustrate a persistent problem in planning for outpatient mental health facilities: delineation of the geographic area which one center can serve adequately. While guidelines have established the size of the population best served by a full-time mental health team of psychiatrist, psychologist, and social worker, the literature reveals no suggestion of the opti-

mum geographic area to be served by either the rural or the urban treatment center.

Altman's study (5) of distances traveled for care from general practitioners and medical specialists in western Pennsylvania during 1950-51 offers relevant information, though psychiatric care is not among the categories of medical specialization for which the study presents specific data. For patients who resided in eight counties adjacent to medium-sized metropolitan areas and who used the services of specialists, Altman showed that 59.4 percent lived within 5 miles, while only 11 percent traveled more than 40 miles for care. For the 27 counties constituting the total studied, he showed a negative relation of 0.74 between average distance traveled and frequency with which specialists' services were obtained. Similarly, the mental health center at Crookston, Minn., reported for 1958-59 a negative relation of 0.79 between utilization and distance. This statistic, like Altman's, does not take into account those persons who failed to obtain services because of the distances involved.

Distances Traveled in Minnesota

Between 1950 and late 1959, two State-supported rural mental health centers, one in the town of Albert Lea and the other in Fergus Falls, provided service to any State resident referred by a licensed physician. During that decade, the urban treatment center in Duluth also accepted referrals from many points throughout the State. The accompanying table indicates the distances from these three outpatient mental health centers to the residence of patients who obtained clinic services between July 1, 1957, and June 30, 1959.

The figures shown in the table for the 12 months from July 1957 through June 1958 are

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based on exact determination of the distance from the patient's residence to the center providing him service, but the 1958-59 figures represent an approximation of distances traveled. Since 1958-59 patients were tabulated merely by county of residence, for that year we have used mileage from the mental health center to the county seat (also the center of county population) in the patient's county of residence as the basis for distribution.

Two other factors impinge on the data presented in the table. While the 1957-58 figures represent patients terminating outpatient treatment during the year, the 1958-59 figures were drawn from a different source (6) and represent active cases (pending cases seen within 90 days). That the number of active cases is greater than the number terminated, under ordinary circumstances, is reflected in the substantially larger number of patients shown at each center for 1958-59. Second, while staff was fairly stable at both Albert Lea and Fergus Falls over the 2-year period, some expansion occurred at Duluth during 1958-59. Also, new centers were opened during the second year under the community mental health services program (4,7). The center at Crookston may have absorbed some patients from the northwest section of the State who might otherwise

have been referred to Fergus Falls, 125 miles away. Likewise, the opening of centers at Rochester and Austin, within a 60-mile radius of Albert Lea, probably reduced referrals to the older center from the area south and east of the Twin Cities. Despite these complications in comparability, the data suggest distance as a definite factor in the utilization of outpatient mental health services.

At the Albert Lea center, 42.2 percent of the patients terminated in 1957-58 lived in the town of Albert Lea (population 13,000); in the following year, 52.7 percent of the active patients lived in Freeborn County (population 36,000), where the town is situated. Eighty percent or more of the patients seen in either year resided within 60 miles of the center. This clinic, formerly State operated, enjoyed strong community support from the outset and has now been converted to a community mental health center serving a two-county region which extends no farther than 42 miles from the center in any direction.

Substantially fewer patients seen at the clinic in Fergus Falls came from the town or its nearby surroundings. Like the center in Albert Lea, the one in Fergus Falls was in a small city (population 13,300) situated in a county (Otter Tail) of less than 50,000 resi-

Distance from three Minnesota mental health centers of patients obtaining clinical services, 1957-59

Miles from center	Albert Lea center				Fergus Falls center				Duluth center			
	1957-58 ¹		1958-59 ²		1957-58 ¹		1958-59 ²		1957-58 ¹		1958-59 ²	
	Number of patients	Cumulative percent										
0	182	42.2	394	52.7	53	13.2	177	31.4	179	82.5	514	88.2
1-20	43	52.1	60	60.7	10	15.8	0	31.4	4	84.3	21	91.8
21-40	64	66.9	130	78.1	54	29.2	75	44.7	12	89.9	20	95.2
41-60	58	80.4	81	88.9	119	59.0	168	74.5	2	90.7	0	95.2
61-80	21	85.3	22	91.8	40	69.0	43	82.1	8	94.4	0	95.2
81-100	33	93.0	34	96.3	30	76.5	45	90.1	8	98.1	17	98.1
101-140	21	97.9	15	98.3	80	96.5	42	97.5	3	99.5	5	99.0
141 and over	9	100.0	12	100.0	14	100.0	14	100.0	1	100.0	6	100.0
Total	431		748		400		564		217		583	

¹ Comprises patients terminating outpatient treatment in the 12-month period, distributed according to mileage from patient's actual residence to mental health center.

² Comprises active patients in the 12-month period, distributed according to mileage from mental health center to county seat in patient's county of residence.

ents. Largely because of its initial location, however, the circumstances in which the Fergus Falls clinic operated during its early years were very different from those in Albert Lea. It was originally set up as an outpatient clinic at the Fergus Falls State Hospital, a large hospital for mental patients. Local resistance to using the clinic at that location was so strong that it was eventually moved to an office building in the center of town. Though patients continued to come primarily from out of town, the clinic was more effectively utilized after its relocation. Three-fourths of the patients terminated in 1957-58 lived within 100 miles; in the next year, probably because of the opening of the Crookston and Willmar centers, three-fourths of the active patients lived within 60 miles of the clinic.

The treatment center at Duluth was established with strong support from within the municipality. This city of approximately 105,000 is in St. Louis County, which, with its 230,000 residents, is one of Minnesota's most populous. During 1957-58, more than 80 percent of clinic patients terminated during the year resided in the city, and the proportion who were Duluth residents remained high the following year (76.3 percent of patients active on June 30, 1959, plus patients accepted through January 31, 1960). Some cases from an adjacent county were seen, but there was relatively little demand for service even from the remainder of St. Louis County in either of the 2 years.

Qualitative analysis suggests other interesting differences in utilization as related to distance. Patients coming from long distances tend to exhibit severe mental disorders, including acute psychotic conditions, relatively often. Crookston, for example, serving an eight-county region in northwest Minnesota, reported psychotic disorders in more than 35 percent of the adults seen at the center in 1958-59, whereas at Duluth the proportion of such patients was only 8.3 percent for the same year (6). Apparently, many patients do not travel extended distances except in emergencies.

Conclusions

The distance patients must travel to obtain service appears to be a significant factor in the

use of outpatient psychiatric care. Forty to sixty miles, the rough equivalent of 1 hour's drive by car, seems to be the practical limit in rural areas. At greater distances, proper utilization of facilities is impeded and the type of referral is adversely affected by the tendency to postpone or forego treatment of less than severe disorders. Nor does the facility situated in a major urban center always provide the service to surrounding rural areas that may be supposed.

The precise location of outpatient mental health services can also influence use, with the first location of the clinic in Fergus Falls, Minn., a case in point.

Distances and location thus constitute important factors to consider, along with population, in the organization and establishment of community mental health services. When community services as distinguished from clinical services—for example, consultation to agencies, provision of inservice training programs, and education of the public—are to be major aspects of a program, distance and location become even more important considerations in planning.

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LETHALITY OF UPPER BODY EXPOSURE

TO X-RADIATION IN BEAGLES

Carl L. Hansen, Jr., M.D., Ph.D.

Sol M. Michaelson, D.V.M.

Joe W. Howland, Ph.D., M.D.

CONTROLLED lethality experiments are necessary as baselines in any study of specific reactions of a given species to ionizing radiation. As part of a program designed to delineate the biological response of the adult beagle to partial body irradiation, the LD_{50/30}, with the lower portion of the body shielded, was determined. For comparison with earlier investigations in this and other laboratories, another series of animals was subjected to whole body irradiation using similar techniques.

Materials and Methods

Test Animals

Ninety-five purebred beagles of both sexes weighing between 5 and 15 kilograms were used in these experiments. All animals were obtained from reputable sources and quarantined for at least 14 days for evaluation and standardization. Daily weights and rectal temperatures were obtained on at least 4 consecutive days prior to irradiation. Three or more preexposure hemograms were obtained on all animals. No animal was used in this study if abnormalities were found on complete physical examination or if clinical or laboratory data indicated any deviation from normal.

Using Anderson and Gee's criteria (1), which state that the beagle is fully mature by 3 years of age but that it attains adult blood values by 1 year, adult dogs were used. Mature adults (older than 36 months) were grouped with young adults (9-36 months) as far as possible, as dictated by their availability. A few animals 9-11 months of age were used since

mature animals were not consistently available. The age distribution was as follows:

Age (months) :	Number animals
9-11	11
12-24	50
25-36	1
37-48	11
49-60	13
60 and over	9
Total	95

Shielding and Dosimetry

Special segmental lead shielding was designed and fabricated. This shielding transmitted less than 1 percent of the air dose. When the X-ray beam was aimed directly across the opening of the shielding, varying amounts of radiation were scattered into the

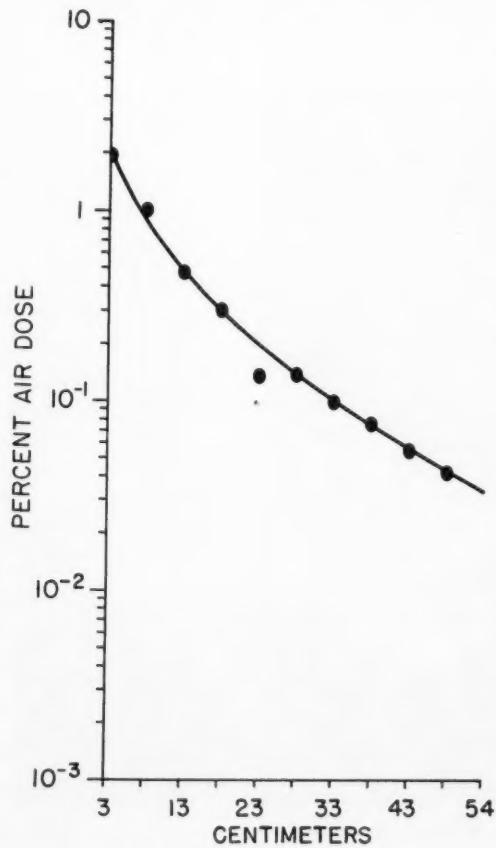
Lieutenant Colonel Hansen, Medical Corps, U.S. Air Force, is with the Bionucleonics Branch, Aerospace Medicine Division, Office of the Surgeon General, Washington, D.C. Dr. Michaelson is assistant professor of radiation biology and chief of the radiation physiology and therapy section of the Atomic Energy Project, University of Rochester School of Medicine and Dentistry. Dr. Howland is professor of radiation biology, chief of the division of medical service of the Atomic Energy Project, and director of the Isotope Center, University of Rochester.

This paper is based on work performed under contract with the U.S. Atomic Energy Commission at the University of Rochester Atomic Energy Project. The views expressed are those of the authors, not official views of the U.S. Air Force.

shielded cavity depending on the position of the detector. The amount of scattered radiation as a function of depth within the cavity is shown in figure 1. When an animal was placed in position, more radiation was scattered into the shielded portion. Cadaver measurements indicate the pelvis of the animal received approximately 5 percent of the incident dose. This is in agreement with results obtained in partial body experiments in mice and rats (2,3) and chicks (4).

An industrial X-ray generator operated at 1,000 kvp. and 3 ma. with only inherent filtration was used for exposure. The half-value layer was 3.0 mm. of lead. The dose rate at 1 meter measured in air with a condenser roentgen meter was 50 r for the first minute and 65 r for each succeeding minute. Tests for the uni-

Figure 1. Scattered radiation as a function of depth within the shielded cavity



formity of the exposure field were made with a condenser roentgen meter together with silver activated phosphate glass microdosimeters (5). Cadaver depth-dose measurements were also made using this technique.

The irradiation field was found to be essentially uniform. Variation from midpoint to the extremes was less than 10 percent. Cadaver depth-dose measurements showed the average midline thorax dose to be 82.4 percent of the midline air dose. In accordance with the suggestion of Bond and co-workers (6) the doses reported are all in terms of midline tissue dose (MTD).

Irradiation Procedures

To avoid possible modification of the response by anesthesia or other medication a plywood retaining box was used for restraint. The xiphoid process of the experimental animal was palpated and the box marked accordingly. Both animal and box were then placed within the shielding to this level with the animal fixed in place by means of straps (fig. 2). The portion exposed included the tissues cephalad of the diaphragm, a small portion of the stomach and liver, and the very tip of the spleen.

Since bilateral irradiation with 250-2,000 kvp. X-rays has been reported to yield essentially uniform tissue-dose distribution (6), this method of irradiation was used throughout the study. Similar techniques were used for the whole body irradiation experiment except that there was no shielding. Each exposure was carried out with the midline of the animal 1 meter from the X-ray target. The X-ray beam was centered on the midpoint of the exposed area.

Five groups of 10 animals were exposed to upper body irradiation at dose levels of 800, 1,000, 1,500, 1,750, and 2,000 r. A sixth group of 10 dogs was sham irradiated under conditions identical to those for the 1,500 r group. Three groups of four dogs each were given whole body irradiation at the 800, 1,000, and 1,500 r levels, and single animals were exposed at the 1,750 and 2,000 r levels. Three groups of seven dogs each were exposed to whole body irradiation of 215, 230, and 280 r.

In order to reduce the incidence of postirradiation vomiting, the animals were fasted on the

exposure day. They were examined daily for 30 days after irradiation. Examinations included clinical observations, neurological examinations, and recording of weights and rectal temperatures. All survivors are maintained under constant surveillance for a delayed effect study.

Results

The 30-day mortality for whole body irradiation is shown in table 1, and for upper body irradiation, in table 2.

The dose mortality curves constructed by the method of Litchfield and Wilcoxon (7) are shown in figure 3. A correction factor of 89.7 percent was used to represent the 100 percent mortality found at the 2,000 r level. The LD-50/30 for whole body irradiation is 250 r with 95 percent confidence limits of 225-278 r. This is in agreement with results reported by Bond and co-workers (8) for mongrel dogs. Gleiser (9) reports an LD-50/30, in air, of 316 r for Walker foxhounds. When corrected by the previously cited cadaver depth-dose measurement

Table 1. Thirty-day mortality resulting from whole body exposure of beagles to 1,000 kvp X-rays

Dose (roentgens)	Mortality ¹	Mean day of death	Range in day of death
215	1/7	26	
230	3/7	17.7	15-20
280	5/7	13.6	10-16
800	4/4	8.25	8-9
1,000	4/4	4	4
1,500	4/4	4	4
1,750	1/1	4	
2,000	1/1	4	

¹ Number dying/number irradiated.

of 82.4 percent, this corresponds to 260 r MTD. These results are lower than the 335 r MTD reported by Shively and co-workers (10) for cobalt-60 irradiation of mongrel dogs.

The LD-50/30 for upper body irradiation is 1,775 r with 95 percent confidence limits of 1,504-2,095 r.



Figure 2. Animal in place ready for exposure

Table 2. Thirty-day mortality resulting from upper body exposure of beagles to 1,000 kvp. X-rays

Dose (roentgens)	Mortality ¹	Mean day of death	Range in day of death
Sham	0/10		
800	0/10		
1,000	0/10		
1,500	1/10	12	
1,750	3/10	14	13-15
2,000	10/10	10.1	4-13

¹ Number dying/number irradiated.

Discussion

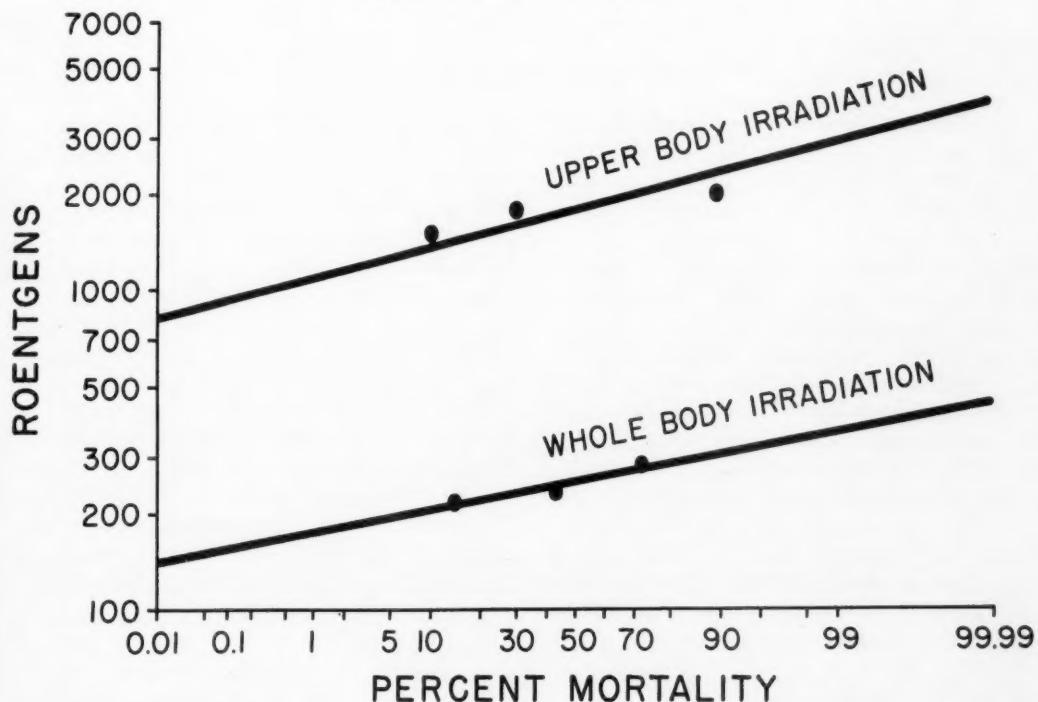
Lethality in the beagle is significantly modified by shielding the lower portion of the body. The LD_{50/30} for upper body irradiation is approximately seven times that for whole body irradiation. The figure for upper body irradiation for the dog is very close to that for the rat (*3*). The modification in lethality observed in shielding the lower portion of the body, how-

ever, is greater for the dog (250 to 1,775 r) than for the rat (750 to 1,750 r). This may be explained in part by the volume of tissue shielded or by a difference in critical organ shielding.

Blair (*11*) has stated that "the gram roentgen dose for lethality will tend to be the same for the whole body inhomogeneously exposed, homogenously exposed, and partially exposed." He further states that this rule may fail in either direction depending upon the radiosensitivity of the exposed tissue. In this study the gram-roentgen dose required to produce a median lethal dose is raised fourfold by the shielding of the lower portion of the body.

Several authors (*2,4,12,13*) suggest that the protection afforded by shielding part of the body results from either a sparing action exerted by the protected tissue on the exposed injured tissues or production of humoral factors by the protected tissue which could influence recovery. Our study, as a whole, suggests a stimulation of certain recovery processes which may arise from the shielded tissue.

Figure 3. Dose mortality curves



Summary

In experiments with beagles, the LD-50/30 for animals with whole body exposure to 1,000 kvp. X-rays is placed at 250 r. The LD-50/30 for upper body exposure to 1,000 kvp. X-rays is placed at 1,775 r. The gram-roentgen dose required to produce a median lethal dose is raised fourfold by the shielding of the lower portion of the body.

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City Health Officers Organize

The establishment of the United States Conference of City Health Officers by the health officers of the Nation's cities was announced in January 1961. The purposes of the organization are:

- To promote, in all its branches, improved municipal public health administration throughout the United States.
- To interchange ideas and experiences and to obtain expert advice on the many and varied special health administrative problems of the major municipalities of the country.
- To foster proper and adequate relationships on mutual health problems between the Federal Government and the States and cities.
- To support the development and maintenance of adequate communications and working relationships between the city health de-

partments, the Association of State and Territorial Health Officers, and the Public Health Service.

- To promote municipal cooperation in order to assist in the improvement of local public health administration.

Harry R. Betters is executive director of the organization; Dr. Huntington Williams, commissioner of health, Baltimore, is president; and Dr. Leona Baumgartner, commissioner of health, New York City, was named vice president. Trustees are Dr. George A. Denison, health officer, Birmingham; Dr. E. R. Krumbeigl, commissioner of health, Milwaukee; Dr. Sanford Lehman, director of public health, Seattle; Dr. Joseph G. Molner, commissioner of health, Detroit; and Dr. George M. Uhl, city health officer, Los Angeles.

EMPLOYMENT OF PART-TIME INSPECTORS IN A RADILOGICAL HEALTH PROGRAM

Sherwood Davies, B.C.E., M.P.H.

A COMPREHENSIVE radiation code promulgated in 1955 by the Public Health Council of the New York State Department of Health required all radiation installations to be registered with the health department by March 1, 1956. Administrative rules of the health department now require that radiation installations be inspected at specified intervals. These rules, necessary as they were, posed an immediate enforcement problem. In New York State, outside of New York City, there are about 7,400 X-ray units located at 6,400 installations.

One of the immediate tasks facing the radiological health section of the New York State Department of Health was the development of a thorough understanding about the requirements of the code on the part of operators of X-ray installations and health department personnel. Operators would have to be advised as to how they could conform to the new requirements of the code.

Experience in other programs has convinced us that face-to-face meetings with the operators at the installation are very effective in obtaining understanding and cooperation. At such meetings the State health department personnel observe equipment and techniques, note hazards, and show the operators how and why improvements and corrections can be made.

An inservice training program in radiological health for State health department personnel was established prior to 1955 and is still in operation.

A limited number of inspections were made in 1955 and 1956; and in 1957, full-time State and local health personnel visited 487 installations.

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tions. At this pace, it would take several years to complete the all-important first visit to each of the 6,400 installations.

The pace picked up speed in 1958 when 2,373 inspections were made, mainly because of more active participation by local health units. However, the addition of two school teachers as inspectors on a vacation-time basis also was important. They were trained by State health department personnel and worked during July and August. When the quality and quantity of their work was evaluated, it was clearly evident that they had performed competently.

With the excellent work records of these two men as credentials, the department of health was able to get funds for 80 man-weeks of temporary help the following summer.

These temporary men were employed to supplement the existing staff in order to complete the first visit to each of the installations at the earliest practical date. On completion of the initial inspection of all installations, the need for temporary personnel will be considerably reduced.

The personnel office of the department canvassed applicants who had previously sought employment. Universities and other educational institutions were contacted. All applicants were interviewed and their qualifications were considered on the basis of their education, training and experience, availability of a car, and residence. A degree in the sciences or engineering, with a physics or chemistry major, and teaching experience in these fields at high school or college level were required. Participation in a civil defense radiological health program was considered especially desirable, and some applicants were in fact recruited through the office of local civil defense directors.

Although applicants were required to pro-

vide their own transportation, the State reimbursed them at the rate of 8 cents per mile. Those residing in areas where the greatest workload existed were given preference, when feasible, in order to minimize traveltine and expenses.

Nine men were recruited by June 1. For the first 3 days of their employment they were given a training and orientation course. A physicist from the University of Rochester and radiological health personnel from the State health department were the instructors. The course included the nature and production of X-rays, shielding, radiation protection, monitoring, and actual inspection of field units.

When the course was completed, the nine men were assigned to local health departments where they were supervised by a full-time medical health officer. Technical assistance was provided by the radiological health section in the State health department. The men were made responsible for instruments and equipment issued to them by the department. An assignment log of these instruments and their condition at issuance was maintained by the radiological health section. Pocket dosimeters were issued so that each employee would know his cumulative exposure to radiation and any dose rate he was absorbing at any given time. Each man was given a letter of introduction and identification.

Work Method of Part-Time Inspectors

To avoid fruitless visits, local health departments set appointment dates for inspections with operators of X-ray installations. Arranging appointments was made easier when professional societies were notified in advance that X-ray inspections were to be made in their area.

At each inspection, the temporary inspector prepared a written report and gave it to the local health officer or public health engineer. These reports were reviewed in the local health department and pertinent facts and comments were sent, in letter form, to operators of X-ray installations. Inspectors were not permitted to make administrative or policy decisions. If an operator refused to permit his facility to be inspected, the inspector referred the matter to

the local health officer. Very few problems of this nature occurred.

Each temporary inspector also submitted weekly reports to the State health department's radiological health section, stating the number of inspections completed and noting the amount of radiation dosage he received during the week. Radiation dosage to the inspectors averaged less than 25 mr per week, although one accident, due to a defective timer switch on a portable unit, exposed an inspector to 100 mr.

The number of inspections per week by temporary employees ranged from 16 to 27. These variations in performance were due to such factors as unequal traveltine between installations, density of population, and prior experience of the employee. When all these factors were considered, the workload performance of the temporary inspectors was about equal to that of a full-time regularly employed inspector who can average 20 to 22 inspections per week.

The temporary employees received a salary of \$200 biweekly, plus expenses when away from the assigned station. Usually, overnight expenses were kept to a minimum. Understandably, rapid processing of expense accounts is highly desirable.

The temporary services of high school and college teachers have expedited considerably our X-ray inspection activity. The recruitment of such employees thus will enable the State department of health to accomplish its objective of controlling the major medical and dental sources of X-radiation exposure to the general population.

Summary

Employment of competent vacation-time or other temporary personnel to make routine inspections of X-ray installations is a quick and effective way to hasten first-round inspections for enforcement of a radiation control program. Recruitment of temporary personnel should begin preferably 4 to 5 months prior to the scheduled date of employment. A wider choice of applicants is possible if recruitment begins early. As the inspection and enforcement program develops, the need for temporary inspection service will be reduced.

Our experience leads us to recommend that the applicant for temporary employment as an inspector be a high school or college science or engineering instructor who has use of a car and resides in or near an area where inspections are to be made. Qualified applicants are often found through local civil defense directors.

In the summer of 1958, nine temporary employees hired by the New York State Department of Health and supervised by local health officers performed well, averaging from 16 to

27 inspections per week. Employees were given pocket dosimeters to record their exposure to radiation. Weekly reports, including number of facilities inspected and the employee's exposure record, were sent to the State health department's central office by the local health departments. Reports of inspections were reviewed by the local health officer, who mailed results to each operator of an X-ray installation.

Legal Note . . . Recordkeeping Requirements

Individual and corporate business records required by statute are not afforded constitutional protection and may be used as basis for prosecution of those engaged in business under the "public records" doctrine. *United States v. Pine Valley Poultry Distributors Corp.*, 187 F. Supp. 455 (S.D.N.Y. 1960).

Defendants, three corporations and one individual, were charged with selling, transporting, or offering for sale unevacuated slaughtered poultry in violation of the Federal Poultry Products Inspection Act (21 U.S.C. 451-469). That statute requires those engaged in processing, transporting, shipping, or receiving poultry or poultry products in commerce to maintain prescribed records and to permit authorized representatives of the Secretary of Agriculture to have access to and to copy such records. The prosecution was based on information copied from the defendants' records by inspectors of the Department of Agriculture.

The defendants moved to suppress evidence derived from the records, asserting that because the act does not provide immunity from prosecution for persons compelled to produce records, defendants were obliged to waive the constitutional protection against unlawful searches and seizures and were thereby deprived of due process of law, in violation of the fourth amendment of the Constitution of the United States. The individual defendant also claimed that the requirement that inspec-

tion and copying of the records be permitted violated his privilege against self-incrimination under the fifth amendment of the Constitution. The corporate defendants could not claim this privilege (*Hale v. Henkel*, 201 U.S. 43 (1906)).

The court rejected the claim of constitutional rights, relying on decisions of the Supreme Court of the United States which had held that records required by Congress of persons engaged in a business affected with a public interest are not private records, but assume the characteristics of public or quasi-public documents. Since, in a sense, the "required records" are in the public domain, they are not accorded the privileges of private papers. The court found that the defendants, who under the statute had custody of the records, had necessarily accepted the incident obligation to permit their inspection and could not claim the constitutional privileges with respect to them. The motion to suppress the evidence was therefore denied.—SIDNEY EDELMAN, Assistant Chief, Public Health Division, Office of the General Counsel, Department of Health, Education, and Welfare.

Program Notes

Immunizations

All Ohio children must now be immunized against poliomyelitis, smallpox, diphtheria, whooping cough, and tetanus before they enter school.

Shoe Store Radiation

Thirty-three States and the District of Columbia have either banned or strictly regulated the use of X-ray fluoroscope instruments used ostensibly for shoe fitting.

Update Nursing Homes

The New York City Board of Hospitals repealed on October 1, 1960, the so-called grandfather clauses of its hospital code relating to private proprietary nursing homes. These grandfather clauses, included in the code on October 16, 1954, exempted nursing homes then in operation from certain plant and equipment requirements. Nursing homes now must comply with the following requirements: 3-foot 6-inch doorways to patient rooms; 6-foot hallways; 100 square feet for each single bedroom; fully automatic wet sprinkler system from basement to attic; an adequate number of elevators large enough to admit wheel stretchers, and equipped with floor leveling devices to serve patients above the first floor; all patients' rooms above ground level; bathrooms with non-slip floors; and bathtubs and showers provided with handgrips in the wall. Applications for waivers or variances will be considered in specific instances upon appeal to a review board.

Radiological Health Training

The Atomic Energy Commission, in attempting to relinquish its radiation health control responsibilities to States, has been urging them to set up administrative machinery for the transfer.

One of the principal deterrents to more rapid progress in State programs for radiological health is the

nationwide shortage of physicians, engineers, physicists, and others technically trained in radiation protection for the general public.

To help overcome this shortage, the Public Health Service trained 600 health workers in fiscal year 1960, and will train 900 in fiscal year 1961. They come principally from municipal, State, and Federal agencies.

Additional courses are planned at two regional radiochemical laboratories and at a laboratory specializing in research and training in X-ray protection only.

State Licensing Plan

Kentucky became the first State to offer a plan to assume licensing and inspection of firms and institutions using radioisotopes and other radioactive material. According to the plan, the State health department's division of radiology would control the licensing of all byproducts and source and special nuclear material. The Atomic Energy Commission has licensed 8,237 organizations over the country, including 3,674 medical institutions and 725 colleges and universities.

Baltimore Progress

An 8 percent reduction in the infant mortality rate in 1960 compared with 1959, accompanied by the continuation of a low maternal mortality rate, has been reported by the Baltimore City Health Department. In contrast, records indicate a further rise in reported cases of infectious syphilis and a slowing of the decline of tuberculosis.

The health department stated that 7 years of fluoridating the city's water supply has prevented dental decay in children. In the past 5 years, the average number of permanent teeth decayed in 6-year-olds was one-fourth the former number.

Establishment of the Mayor's Neighborhood Conservation Committee has strengthened the city's well-

coordinated inspection and law-enforcement efforts in the battle against blight and slums. Preliminary findings of a 5-year study indicate that improved housing improves health.

TB Drug Distribution

The New Jersey State Department of Health has received funds to purchase antituberculosis drugs for distribution to its 66 biologics stations for use by patients who otherwise could not afford them. In cooperation with the New Jersey Tuberculosis and Health Association and county and local agencies, the department is urging establishment of registers on a county basis to ascertain the whereabouts and activities of tuberculous persons.

Minimum treatment standards have been agreed upon by tuberculosis control people in the State, with a program of treatment patterns and specific drugs and dosages.

New Jersey considers eradication of the disease an attainable objective in the 1960's, but warns that much work will be required. There were 2,971 cases reported in 1960 compared with 2,909 in 1959; deaths declined from 433 in 1959 to 369 in 1960.

Intractable Asthma

Children with intractable asthma, a perennial type which does not respond to conventional forms of treatment, have been studied by the National Foundation for Asthmatic Children at Tucson, Ariz., which provides programs for their care and rehabilitation. The studies find many factors in their chronic conditions, but reveal no greater emotional problems in this group than in a control population. In psychological tests, a majority of these children were above the normal range.

Of 141 children studied, 44.6 percent showed excellent improvement; 19.1 percent, moderate; 29.6 percent, fair; and 6.3 percent, no improvement. One child died.

Absenteeism at the school during 3 years of the 4-year study was less than for the public school system as a whole.

Accident Prevention in Western States

CHARLES R. HAYMAN, M.D., M.P.H.

STATE health departments engage in many accident prevention activities. Their major areas of interest are research and analysis; training and education of staff, other professionals, and the public; direct safety services in institutions operated or supervised by the health department; special accident prevention services, such as poison control, and technical consultation to other agencies; and coordination of and cooperation in the activities of State governments and voluntary organizations.

The accident prevention program of a State health department usually includes general accident prevention, such as inculcation of safe attitudes, discussion of topics such as "accident susceptibility," and attention to special fields, such as home, traffic, work, recreation, and school safety.

Accident prevention programs and activities in Region IX of the Department of Health, Education, and Welfare, with headquarters in San Francisco, vary with each State. Some States have very little activity; others have a significant amount in certain fields. In none of them, however, is the program formally organized, well-defined, or headed by a full-time director. Much more can be done and will be done in every State in the region.

The direction of the accident prevention program of each State health department has been influenced by the magnitude of the problem, statutory obligations, and the special interest of the health department. In one State, more attention has been paid to home accidents because in that State there have been more injuries and

deaths from this cause than from any other. In several States, the health department has not entered the field of industrial safety because the State labor department has sole responsibility in industrial accidents. The health departments of some States have felt more comfortable working with home accidents than in the traffic field because their experience in other programs has taken them into the home.

The status of activities and programs in accident prevention in Region IX is summarized in this report. Region IX comprises Alaska, Arizona, California, Hawaii, Nevada, Oregon, Washington, and the Territory of Guam.

Research and Analysis

Mortality analyses are being done by all the States and the Territory in Region IX. All of them distinguish between deaths due to accidents at home, in traffic, and in industry. For example, Alaska has had a large number of transportation fatalities, particularly aircraft accidents. Nevada has found that the number of accident fatalities in the State is excessively high in comparison with national figures.

No State in the region is studying statewide reports on nonfatal accidental injuries. However, the Alaska division of health has just initiated reporting of accidental injuries by hospitals throughout the State. The Hawaii Health Survey is producing considerable information on the extent of nonfatal accidental injuries, and the Hawaii Department of Health hopes to analyze these data and to use the findings in program planning. The Washington State Department of Health is assisting Group Health Association, Inc., of Seattle, in a special

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project, tabulating and analyzing all accidental injuries to children 0-13 years old who report to the association for inpatient or outpatient treatment.

The maternal and child health bureau of the California State Department of Public Health is investigating the epidemiology of childhood accidents. In two California counties, hospitals with emergency facilities are reporting to the State health department all accidental injuries to children throughout the year. In addition, samples of private physicians are periodically reporting on all child injury cases they see during a designated period. Cases seen in 1957 and 1958, with epidemiological analyses by age, sex, season, and type of accident, have been described by Cobb and associates (1), and a detailed analysis of the 1957 data has been made by Stallones and Corsa (2).

In another study recently begun by the California State Department of Public Health through a grant from the National Institutes of Health, Public Health Service, an examination is being made of the medical records of 27,000 children seen under one medical care plan. The aim of the study is to determine accident frequency patterns among children; for example, low, high, continual, or intermittent. This will be followed by an attempt to differentiate between the various groups according to physiological, psychological, sociological, and environmental factors, using data obtained from a number of sources, including interviews with children and their parents, school records, and observation of environment.

Since 1957 the Public Health Service has had a field investigator assigned to the California State Department of Public Health to work on the Cornell Automotive Crash Injury Research. The purpose of this project is to obtain reliable data on the frequency, nature, and specific causes of injury to occupants of passenger cars involved in accidents. Medical data submitted by physicians treating accident victims are collected by the investigator and matched with information supplied by highway patrol officers. This information is transmitted to Cornell University for statistical tabulation and analysis.

From March 1958 to March 1959, the Arizona State Department of Health collated and re-

viewed medical reports and sent them on to Cornell. For 2 years, up to June 1960, the Oregon State Board of Health made field visits and coordinated medical reports from the field.

Hawaii does routine epidemiological investigations of fatal accidents and nonfatal injuries in children requiring hospitalization.

Experimental research in traffic safety is being carried on by the Hawaii Department of Health, financed by a grant from the National Institute of Mental Health, Public Health Service. The accident records of a group of accident repeaters who are commercial drivers are being compared with the records of a similar group having a low frequency of accidents.

Both groups of drivers have been tested to determine their intelligence, perception, tolerance to frustration, ability to solve problems, and their concept of themselves as vehicle operators. Psychological measures are being developed to distinguish between "good" and "poor" drivers. Several hundred drivers have been examined, ranging from highly skilled "safe" drivers to those who have been involved in two or more serious accidents in the last 5 years. After the success of the measuring instruments has been analyzed, new applicants for drivers' licenses will be tested in an effort to predict which persons are likely to become involved in traffic accidents.

Training and Education

All the States in Region IX, but not the Territory of Guam, sent representatives to a regional seminar on accident prevention held in Seattle, Wash., in 1958. No State in the region has held a statewide seminar on this subject for its public health workers, State or local, although in 1959 Washington held a workshop on home and school accidents for public health nurses from local health departments.

Accident prevention topics have been on the agenda of staff conferences of State health departments in Alaska, Hawaii, Nevada, Oregon, and Washington. Likewise, presentations have been made and discussions have been held at meetings of the public health associations of Arizona, California, and Oregon attended by many public health workers. Formal courses for inservice training of public health personnel

in accident prevention are nonexistent in the western States. The California health department has participated in the State's "defensive driving" training for its employees.

The best overview of current thinking and activities in the whole field of accident prevention is probably that presented at the annual meeting of the National Safety Council. A representative of the Washington State Department of Health attended this meeting in 1959; the Oregon and Washington health departments each sent a representative in 1958.

Health departments can take part in teaching accident prevention methods to private physicians, hospital nurses, motor vehicle administrators and examiners, State and local policemen, and firemen.

In California, professional training of persons outside the health department has been done in the traffic field, where the health department had much to do with arranging the program of the medical section of the Governor's Committee on Traffic Safety in 1959 and 1960.

All the States in Region IX have reached hospital personnel through the section of hospital licensure of the State health department, particularly during inspections of procedures, practices, and facilities, especially with respect to fire hazards. State health departments have also participated in discussions of accident prevention at meetings of State hospital associations. A 3-day workshop on "Hazardous Areas in Hospitals," co-sponsored by the Washington State Department of Health and the Washington State Hospital Association was conducted in 1959.

The western region of the Association of Motor Vehicle Administrators meets annually and, among other topics related to licensing, discusses medical and public health subjects. None of the State health departments in Region IX have been represented recently. The health officer of San Jose, Calif., however, took part in a 2-week workshop for motor vehicle administrators sponsored by the association in June 1960.

The Oregon State Board of Health is a co-sponsor of the annual Northwest Industrial Health Conference, an activity of the Portland Chamber of Commerce sponsored by 25 organizations. At this conference accident prevention

in industry is one of the major topics discussed by industrial physicians, nurses, engineers, and hygienists.

Education of the public has been the main endeavor of most health departments in Region IX. This has been accomplished in five ways:

- Utilization of mass media—TV spots, radio talks, and newspaper articles on such subjects as seat belts, safe toys, and home poisonings.
- Informal personal teaching of mothers, children, and homeowners by nurses and sanitarians during visits in the home, clinic, or health office. Most of these visits are for reasons other than accidents or accident prevention. State health department staffs provide local health personnel with information on accident prevention through reprints, special articles, bulletins, and memorandums, and by meetings for discussion.
- Assistance to departments of education in the development of school curriculums.
- Public group discussions and meetings. However, few such meetings have been held in any State in the region.
- Community organization for accident prevention. This is occasionally done by the health department alone but more often in co-operation with State and local safety councils, farm groups, and other interested organizations.

In Alaska, educational activities include periodic news releases designed to make the public aware of seasonal hazards, such as boating and fishing during the summer. The health department's quarterly publication, *Alaska's Health*, publishes articles on accident hazards and accident prevention.

The Arizona State Department of Health has done much to publicize the network of poison control centers affiliated with the University of Arizona and to advise parents how to react to poisoning emergencies. Articles have been published in the *Arizona Public Health News* and in newspapers throughout the State. Radio and TV stations have carried "spots" about the centers, giving their addresses and telling how to reach them. Nevada is similarly publicizing the services of its two recently established poison control centers.

California's Health, published twice a month by the State health department, has carried a

number of articles on accident prevention, and news releases issued by the department have publicized the hazards of plastic bags. However, the State health department has left most education of the public to local health departments.

The Hawaii Department of Health has used mass media extensively. It has issued several booklets on prevention of childhood home accidents and on care of children injured in the home. These booklets have had wide distribution and use. The health department has done direct teaching of the mouth-to-mouth method of artificial respiration, mainly by film showings to lay groups. In addition, health department staff members have helped the department of public instruction develop a curriculum guide for teaching health from kindergarten through the 12th grade. The guide has recently been completed, and members of the health department staff will assist in implementing its use in the schools.

The Oregon State Board of Health has been particularly active in education for farm safety by participation in State fairs and similar programs with farm and rural organizations. The Washington health department participated in farm safety programs of the State Rural Health Committee in 1960.

In Washington in 1959, the health department engaged in community organization in five areas for the purpose of getting local women's groups, service clubs, and other organizations to examine the local problems and to work together on projects arising from these self-surveys. Although this activity was apparently successful, the health department has not been able to continue it.

Direct Services

Safety in institutions is a matter of concern in all jurisdictions in which the health department operates or supervises such facilities as hospitals, nursing homes, health centers, administrative offices, and laboratories. However, the State health departments in Region IX are principally occupied with administrative and laboratory facilities. They give some attention to accident hazards but have no formal accident prevention program.

In Alaska, the health department's engineering maintenance man makes inspections and repairs in health centers in isolated areas which are exposed to severe fire hazards. The administrator of the Arizona State Tuberculosis Sanatorium is much concerned with the safety of patients and employees and has a watchful program. In Guam, the Territorial Department of Medical Services operates the general hospital and is concerned with fire, as well as with falls by patients. In Hawaii, the State health department operates hospitals and clinics. Some of these are in old frame buildings which are moderately hazardous. A departmental safety council has been set up very recently. It has been given responsibility for studying safety procedures in all institutions operated by the health department and for making recommendations for correction of hazards.

In California, a departmental safety committee reviews on-the-job vehicle accidents to its employees, and every such accident is followed by a personal interview with the injured employee. California and Oregon require installation of seat belts in all State-owned cars. Cars operated by the Nevada State Department of Health are similarly equipped. These health departments have also urged employees to install belts in their privately owned cars.

All the States in the region conduct some program of licensing and periodic inspection of hospitals and nursing homes supervised by the health department. These programs sometimes include education of employers and employees in safety practices and use of equipment. Again the greatest hazards to patients are fire and falls. In Arizona, California, and Washington, the State fire marshal's office acts jointly with the State health department. The health department's responsibility is for the safety of patients rather than employees. The State department of labor or a similar department is usually responsible for the safety of employees. Through the Hill-Burton program, all States are reducing the accident hazards in newly constructed hospitals.

Nursing homes are licensed in all areas, except in the Territory of Guam. The fire department or fire marshal's office conducts an inspection in all States where licensing of nursing homes is required. The vast majority of

nursing homes are proprietary and most of them are of the type of construction which presents fire hazards. Institutes for nursing home operators in Arizona have included instruction in the care of patients to prevent accidents and in the use of safety equipment. California, Hawaii, and Oregon have accomplished such teaching in inspection visits. In Washington, a special team mainly concerned with rehabilitation has visited many nursing homes and discussed patient safety.

Special Services

The most common special accident prevention services operated or supervised by health departments are poison control centers. In Oregon, the State board of health, with the medical school and the State medical society, aids in direct operation of the State poison control center. In Arizona, the university acts as the coordinator, and the health department helps by publicizing its activities. In Alaska, California, Hawaii, Nevada, and Washington, the State health department acts as a coordinator and clearinghouse for poison control centers throughout the State. For the most part, the health departments distribute current scientific information to the poison control centers and receive clinical and statistical reports from them. These reports are reviewed and compiled to show the statewide picture and are sent to the Public Health Service for inclusion in national reports.

Another type of special service is the medical examination of school-bus drivers in Oregon. The 1959 State legislature required the State board of health to establish medical standards for such drivers. The examinations are made by private physicians and the reports are forwarded to the State board of health for review and certification. In 1959 the board reviewed the reports of 2,500 examinations.

For the prevention of aquatic accidents, the program of the California State Department of Public Health has been to advise in the development of State laws, to develop appropriate regulations, and to advise the local health departments which, in addition to the State department of health, are charged with the responsibility of enforcing these laws (3). Ad-

ditional activities include sponsoring of conferences to stimulate further activity in the field of prevention of aquatic accidents resulting from bathing, boating, and fishing.

A manual on swimming pool operation was published in 1960 by the Washington State Public Health Association from material supplied by the State health department (4). This manual describes safety measures and provides a safety checklist.

All the State health departments in Region IX provide technical consultation to other agencies. In Oregon, the State board of health acts as a consultant to the Motor Vehicle License Bureau in the determination of the fitness to drive of certain individuals having reported illnesses and disabilities. The motor vehicle administrator has requested technical opinions on more than 800 individuals with heart disease, epilepsy, and other conditions.

In California, discussions between the health department and the department of motor vehicles were initiated in 1958 to outline areas of joint interest. In that year, the health department also set up an expert medical committee to advise the Highway Patrol on administration of a new law regarding drugs and driving. In 1960, at the request of the Highway Patrol, certain materials were tested in the health department laboratory for flammability.

All the States in Region IX provide mortality analyses and available information on morbidity to other agencies on request.

Coordination and Cooperation

In order to coordinate State governmental accident prevention activities on a formal basis, the health department needs delegation of responsibility or authority by the Governor or legislature. This may be done for the whole field of accident prevention or for some segment of it, such as home safety. In Region IX, the nearest approach to such coordination is being made in Oregon. In the field of accidental poisoning, the Oregon State Board of Health is endeavoring to coordinate the activities of the State university, the State medical society, and the State board of health; in the field of home accident prevention, the board of health has spearheaded efforts to make the Governor's

Committee on Home Safety more active and to get an appropriation for its work.

Cooperation with other activities is best exemplified by participation of State health departments in programs of Governors' committees on traffic safety, on which other agencies, such as highways, motor vehicle licensing, and State police, are represented. Such a committee is just getting started in Arizona. Similar committees are active in California and Hawaii. The public health agency is not represented on the Traffic Commission in Oregon nor on the Governor's Committee on Traffic Safety in Nevada or Washington.

In 1958 and 1960 the directors of the health departments in California, Oregon, and Washington, together with representatives of State motor vehicle departments, participated in national workshops on traffic safety. These workshops were sponsored by the Public Health Service and the American Association of Motor Vehicle Administrators.

The Washington State Department of Health assisted in planning the program for the home safety session of the Governor's Safety Conference in 1958 and 1960, and health department representatives participated actively in the sessions.

In no State in Region IX has the health de-

partment tried to coordinate activities of voluntary organizations in general accident prevention. In Oregon, an attempt has been made to coordinate the efforts of rural and farm organizations interested in farm safety.

In most States leadership in coordination of efforts by voluntary organizations has been taken by the State safety council. Such a council is active in California, Hawaii, Oregon, and Washington, and has the cooperation of the State health departments. For example, the State health department acts as a distributing and collecting point for reports by local health departments on the home safety inventory conducted by the safety council.

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New Public Health Service Divisions Organized

Three new divisions were established in the Bureau of State Services, Public Health Service, on February 1, 1961.

The Division of Accident Prevention, directed by Dr. Albert L. Chapman, encompasses and expands the functions of the Accident Prevention Branch. The Division of Chronic Diseases incorporates the activities of the Heart Disease Control, Cancer Control, and Chronic Disease Branches. It is headed by Dr. Leslie W. Knott. The Division of Community Health Practice, under Dr. James K. Shafer, replaces the Division of General Health Services.

As noted earlier, occupational health services are established in a separate division, directed by Dr. Harold J. Magnuson. The tuberculosis program, now a branch of the Communicable Disease Center, continues to have its headquarters in Washington, under direction of Dr. Edward T. Blomquist.

The Division of Special Health Services and the Division of General Health Services were abolished January 31, 1961.

Q FEVER ANTIBODIES IN DAIRY CATTLE AND IN HUMANS IN WASHINGTON STATE

Daniel Weiner, V.M.D.

Everette F. Baker, M.S.

Herman C. Mason, Ph.D.

RECENT studies indicate that Q fever is much more widespread in the United States than was formerly realized. Infection in cattle has now been demonstrated in 35 States, and human infection has been reported from 18 of these States (1). "Significantly," Luoto states, "infections are being detected wherever a search for the disease is made" (2).

A limited serologic survey in eastern Washington in 1948-49 (3) found Q fever in both humans and animals, and the author concluded that cattle were an important reservoir. To provide up-to-date information on the disease throughout the State, we conducted a screening survey for the presence of Q fever antibodies in dairy cows and in humans in 1959.

Material and Methods

Milk samples were collected, with the cooperation of the Washington State Department of Agriculture, from all large commercial dairies supplying the main urban centers: Seattle,

Yakima, and Spokane. The samples were obtained by withdrawing a small portion of milk from the 15-day composite herd samples retained by the dairies for butterfat testing. Since the composite samples contained a preservative, mercuric chloride, refrigeration of the samples was not required.

The milk samples were identified by numbers assigned to them by the plants. Since each plant had producers in several counties, no further attempt was made to identify the specimens at the time of collection. After the tests were run, the numbers for positive samples were submitted to the milk plants for identification by county and city or town. No differentiation was made between grade A milk producers and factory milk producers.

A total of 4,172 samples were collected, each representing one dairy herd. They came from 26 of the State's 39 counties, as well as three nearby States. Excluding the samples known to be from other States (22 positive samples), the dairy farms represented in the survey constituted approximately 30 percent of the 13,471 such farms counted by the U.S. Department of Agriculture in its 1954 census of commercial milk producers.

Samples of human blood serum were obtained from blood banks in Yakima and Seattle, Wash., and Portland, Oreg. The samples were pilot tubes of blood that either had already been used or were out of date and no longer needed for other studies. They were identified by numbers assigned to them by the blood banks.

Of 3,126 serum samples tested, 2,860 were from residents of Washington, and most of these were from residents of nine counties. The Washington residents contributing samples

Dr. Weiner was with the Communicable Disease Center, Public Health Service, on assignment to the Washington State Department of Health when this study was made. He is now chief of the Epizootiology Section, Division of Air Pollution, Public Health Service. Mr. Baker was assistant epidemiologist, and Dr. Mason was director of laboratories, Washington State Health Department. Mr. Baker is now at the College of Veterinary Medicine, Washington State University, and Dr. Mason is chief of the medical services unit of the space medicine section, Boeing Airplane Company. Leah Waln in the Washington State Health Department assisted in performing the tests made in this study. (Received for publication June 15, 1960.)

Figure 1. Number of bovine milk herds and human serums positive for Q fever antibodies, Washington State



Large numbers: positive bovine milk herds.

Small numbers: positive human serum samples.

constituted about one-tenth of one percent of the 2.7 million estimated population of the State (1958 figures of the U.S. Bureau of the Census). The survey population, however, was not representative of the total population in age distribution or place of residence. Almost all blood donors are over age 21 years, and a majority of those contributing to the blood banks used in this study live in urban areas.

All specimens were screen tested by means of the capillary agglutination test, a rapid, simple, and economical test applicable to either serum or milk samples. Procedures set down by Luoto (4-6) were followed, except the samples were tested only undiluted. The test itself, of course, dilutes the samples almost one-half, and pooled milk represents dilution of milk from infected animals by that from uninfected animals in the same herd.

Test reactions varied from slightly positive to strongly positive, but since this was a screen-

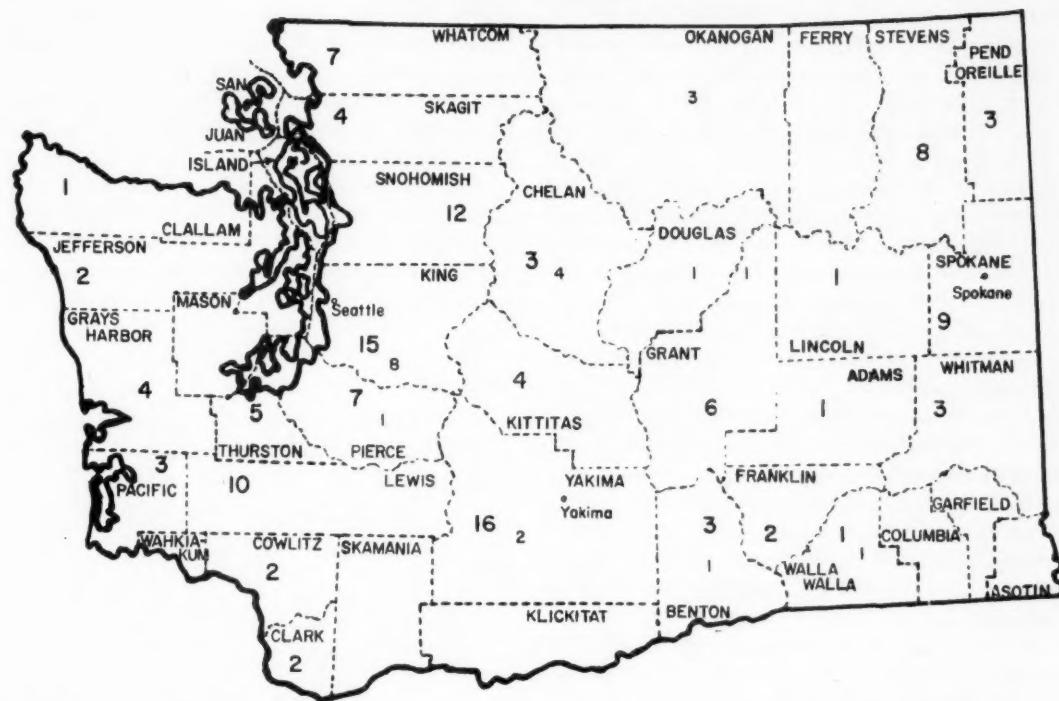
ing survey, all positive reactions were recorded without regard to degree of positivity. All positive serums were retested to validate the accuracy of the first test readings.

No attempt was made to isolate *Coxiella burnetii*, since all the milk samples contained a preservative. Because of the large number of specimens collected, it was not possible to visit individual dairy farms to collect fresh milk for isolation of the organism or to locate the persons with positive reactions.

Results

Of the 4,172 herd milk samples, 844, or 20.23 percent, were found positive for Q fever antibodies by the capillary agglutination test. Forty-three of the positive samples could not be identified by the milk plants because of errors in numbering or because the producer subsequently discontinued selling his milk to that plant. Twenty-two positive samples came from

Figure 2. Number of cities and towns with bovine milk herds or human serums positive for Q fever antibodies, Washington State



Large numbers: positive bovine milk herds.

Small numbers: positive human serum samples.

three nearby States. Subtracting the 22, the percentage of positive milk samples from herds in Washington was 19.81 percent.

The number of positive milk herds in each county is shown in figure 1, and the number of cities or towns where positive herds were located, in figure 2. No percentages are given because only positive samples were identified and the total number of samples for each county is therefore unknown. Hence, the figures on the maps do not indicate prevalence of Q fever antibodies by county. Counties with the largest number of positive samples, King, Snohomish, and Yakima, undoubtedly provided the largest number of milk samples. The counties which showed no positive samples either provided no samples at all for this survey or a very small number.

Ninety-five, or 3.32 percent, of the 2,860 human serum specimens from Washington residents were positive for Q fever antibodies.

Nineteen of the 266 samples from a neighboring State were also positive. The number of positive specimens by county in Washington is shown in figure 1, and the number of cities and towns represented, in figure 2. Again, the numbers do not indicate prevalence by county. King County has the greatest number of positive samples, but this county, which has the largest population in the State, probably supplied the largest number of samples.

Positive human serums were found in two counties from which no milk specimens were tested. These counties are sparsely populated and have few dairy herds. Population movements may explain the occurrence of these positive human specimens.

Discussion

The capillary agglutination test, according to Luoto (2), is highly specific and sensitive for antibody against *C. burnetii* in serum or milk.

Stoenner and co-workers (7) used the test on milk samples in 1958 to determine the prevalence of bovine Q fever in previously identified endemic areas of Idaho. The reliability and validity of the test, as performed on pooled herd milk samples, for identifying infected herds was further demonstrated in 1959 by Tjalma and Braun (8). In their study, results of tests on an average of 12 samples from each of 160 herds over a 26-week period were remarkably consistent. There was a high correlation between milk and blood Q fever titers of individual animals, and rickettsiae were isolated from positive milk samples.

Assuming, on the basis of such reports, that the capillary agglutination test is a valid indication of the presence of Q fever antibodies, the findings of our survey suggest that Q fever, at least in cattle, is on the increase in Washington. The survey made in 1948-49, though limited primarily to animals and students of the State College of Washington in Pullman, is pertinent. That survey, using the complement fixation test, found infection rates of 2.75 percent (9 of 327) in cattle and 2.08 percent (6 of 289) for humans. Most of the positive cattle serums were from the college beef herd, and the three human serums with the highest titers were from veterinary students with a past history of respiratory infections.

Results of the capillary agglutination test, as performed in our study, are not directly comparable with results of the complement fixation test. However, if one accepts the 1949 infection rate for cattle of 2.75 percent, the finding of 19.81 percent positive would not represent an unprecedented increase in Q fever over a 10-year period (1). The 1959 rate for humans of 3.32 percent would represent a minimal increase for a 10-year period. It should be remembered that the blood samples in the 1959 survey were taken from blood banks in urban centers. Blood samples from residents of agricultural areas would be expected to yield higher proportions of positives.

Despite the relatively high percentages of dairy cattle and humans apparently carrying Q fever antibodies, only one serologically proved case of Q fever in man was reported in Washington in 1959. It seems likely that many cases of this disease are not being diagnosed.

Q fever in man is often very nearly asymptomatic or subclinical, or the symptoms are easily confused with those of other diseases. Laboratory confirmation requires isolation of the causative organism from blood of the patient or a demonstration of a rise in antibody titer between acute and convalescent stages of infection.

The results of our survey are intended only to illustrate the presence of Q fever in the State. More detailed serologic and isolation studies are necessary to determine the incidence of the acute and chronic stages of this disease.

Summary

In a screening survey, 4,150 herd milk samples from 26 of the 39 counties in the State of Washington were examined for Q fever antibodies by the capillary agglutination test. Eight hundred and twenty-two, or 19.81 percent, were positive. Blood serum specimens numbering 2,860 from residents of nine counties in the State were also examined by the same test, and 95, or 3.32 percent, were positive. The capillary agglutination test is simple to perform and is easily read, and a screen test is a valid indication of the presence of Q fever antibodies in both dairy herds and humans.

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Seminars for Public Health Administrators

THREE IS a long-standing record of cooperation between universities and public health agencies. Collaboration in the field of management and administration, however, is relatively new and limited. Although most of the established theories and practices of administration can be applied to public health management functions, a certain distinction exists between management of an industrial or commercial organization and management in government which involves relationships between Federal, State, and local units.

In the Bureau of State Services of the Public Health Service, most of the programs are headed by people who have received training in the professional arts and sciences that make up public health. A few have had training in public administration, economics, or political science. The Public Health Service has long felt that because of their varied educational background, management "know-how" of key personnel could be supplemented and enhanced by "capstone" courses in management subjects, particularly if the subject matter and presentation could be custom tailored to specific program needs.

As a result of long association and close collaboration in research and teaching projects in basic science, medicine, biology, chemistry, and the like, Emory University and the Public Health Service's Communicable Disease Center in Atlanta, Ga., became interested in the possibility of providing specialized instruction in management subjects for personnel engaged in public health administration. Working together, professors of the university's department of political science and school of business administration and officials of the Communicable Disease Center developed a seminar program along these lines. Somewhat on a trial basis, the first seminar was held at Emory University in 1957. The 20 participants were care-

fully selected from key positions which had a high degree of management responsibility.

The first seminar was a success, and the project has now become a permanent part of the Bureau of State Services' training and career development program. The seminars are held on the Emory University campus in Atlanta each spring and fall. Six seminars have been conducted to date, and approximately 120 officials from various Bureau programs in all parts of the country have participated.

Originally lasting for 4 days, the seminar now runs for a full 5-day week. Each morning and afternoon session is devoted to a different specialized area of administration. Each session is begun with a lecture by a well-known administrator or authority on the subject under study. Generally, after the lecture there is a brief discussion or a question and answer period. Following this, the class is divided into two groups for a workshop session on a selected case study, each group headed by a moderator from the Emory University faculty. The case studies deal with problems involving the management subject previously presented by the lecturer. Other techniques include the incident process, role playing, and brainstorming.

The topics covered in the seminars have been varied to meet the needs of the participants. Program planning, organization, program staffing, budgeting, program execution and reporting, employee motivation, communications, delegation of authority, and research administration are among the subjects that have been studied.

Lecturers are selected because of their known ability in the subject being presented. They have included executives from business and industry, officials in high government positions, and professors from other universities and educational institutions.

Seminar participants live in quarters on the

university campus and take meals at the university dining hall. Usually one organized social activity is held early in the seminar period to introduce participants and staff and set the stage for informal exchange of ideas and opinions. Two group luncheons are held during the week to provide further opportunity for informal discussion.

Holding the seminars and providing living quarters at the university has proved much more satisfactory than use of government facilities. The university setting seems to foster a spirit of fellowship, and it affords an opportunity for the students to discuss informally classroom topics, as well as their job experiences, during their free time. Removing the students from physical proximity to their jobs also prevents disruption by matters related to their regular work.

To create an optimum teaching-learning environment, each seminar group is limited to 20 participants. However, graduate students of the university are permitted to attend the formal lecture if they wish. Members of the university faculty also have an opportunity to exchange ideas with lecturers during their visits.

With the limitation of students to 20, there has been a healthy competition for selection. About 2 months before each seminar, announcements are sent to the Bureau division chiefs and regional medical directors requesting nominations. At present, nominees must be commissioned officers at the full grade (lieutenant commander) or above or civil service personnel in grade GS-12 or above. As the number of nominations far exceeds the quota, a special committee chaired by the Bureau executive officer makes the selection. The committee tries to select nominees who will not only achieve the most benefit from instruction, but who will also have the greatest opportunity to apply the new knowledge in their day-to-day work. It also attempts to maintain a balanced representation from the various disciplines and from

the field of management. A group of participants with a wide variety of interests and backgrounds makes for a lively exchange of ideas and a resulting appreciation and understanding of the "other fellow's" problems.

Based on its experience and success with these management seminars for public health administrators, the Public Health Service recommends a similar arrangement for other health agencies that have a need and desire to provide such training for their employees.

Dr. Lynwood M. Holland, chairman of the department of political science, Emory University, is the presiding officer for all sessions of the seminar. He also participates, as the university representative, in program planning and seminar arrangements. In summing up the value of the seminars from the university's viewpoint, Dr. Holland has said:

"Unquestionably, the greatest benefit has been the sharing of problems in planning and conducting the seminars by representatives of the two organizations. Such an experience has brought a deeper understanding of the problems of administration in the two organizations and has enriched the programs of each. The seminars have resulted in strengthening the relationships between the two organizations."

In addition to the valuable service of Dr. Holland and other members of the university staff, I wish to recognize the assistance of Harry C. Abernathy, assistant executive officer, Bureau of State Services, and Russell B. Runnion, employee development officer of the Communicable Disease Center. Mr. Abernathy has overall responsibility for seminar matters at the Bureau and headquarters level, while Mr. Runnion is the seminar coordinator in Atlanta and arranges for speakers, development and publication of the seminar programs, and other related activities.

—RICHARD W. BUNCH, *executive officer, Bureau of State Services, Public Health Service, Washington 25, D.C.*

Translated from the Russian

K Voprosu o Prirodnoi Ochagovosti Nekotorykh Gel'mintozov

Natural Foci of Infection Of Some Helminthiases

E. S. LEIKINA

The article in Russian appeared in the *Meditinskaiia parazitologiiia i parazitarnye bolezni* (*Medical Parasitology and Parasitic Diseases*), March-April 1957, pages 140-152. The author is with the section of experimental parasitology of the Institute of Malaria, Medical Parasitology, and Helminthology of the U.S.S.R. Ministry of Health, Pogodinskaia, Moscow. The director of the institute is Prof. P. G. Sergiyev, and the section head, Prof. V. P. Pod'yapol'skaya. The translation was done by the Russian Scientific Translation Program of the National Institutes of Health, Public Health Service.

ACCORDING to the data in the literature, a human trichinellosis is encountered in all countries, and it has a focal distribution. Large foci of trichinellosis exist in the United States where, according to the material of American workers, it was estimated about 21 million persons were infested with trichinellae. Trichinellosis was also quite widespread in Germany, particularly until the thirties of the present century (according to Kalu's summary, 16,541 cases of trichinellosis were recorded from 1866 through 1921), as well as in certain other countries. In the U.S.S.R., Byelorussia is a stabilized focus of trichinellosis (according to

data of official statistics, 709 cases of trichinellosis were recorded in the Byelorussian S.S.R. in 1955); various regions of the Ukrainian S.S.R. and certain other republics are also stabilized foci of trichinellosis.

In analyzing the data in the literature on the spread of human trichinellosis, it may be ascertained that along with foci of this disease which have been stable for many years there not uncommonly occur brief outbreaks of it, which occur sporadically in various corners of the globe. The occurrence of these outbreaks has remained unclear from the epidemiological point of view until recently, since the majority of research workers thought of trichinellosis as a "synanthropic" disease the transmission of which is carried out mainly by domestic animals such as hogs, cats, dogs, and also rats. From the standpoint of the theory it was difficult to explain the cause of the sudden occurrence of the infestation in man in a locality previously favorable with respect to trichinellosis.

Numerous investigations which have been conducted in recent years both in the Soviet Union and abroad, however, have shown clearly that trichinellosis is considerably more widespread among wild animals than among domestic animals. Of the wild animals, wolves, foxes, polar foxes, raccoons, badgers, minks, bears, wild boars, lynxes, coypus, hedgehogs, moles, field mice, skunks, martens, squirrels, ermines, beavers, muskrats, weasels, lemmings, seals, walruses, lions, and tigers have now been recorded as hosts of trichinellae. It is entirely possible that as a result of further investigations this list will be lengthened considerably.

As observations of a number of authors have shown, in the U.S.S.R. trichinellosis is most often found in wolves. Thus, A. V. Merkushev (1953) found trichinella larvae in all 10 wolves which he examined in Voronezhskaya Oblast. A. N. Kadenatsii (1953) recorded trichinellosis in 9 wolves dissected by him in Omskaya Oblast; B. F. Bobrov (1955) found trichinella larvae in 148 out of 152 (97 percent) of the wolves in Saratovskaya Oblast; E. M. Geller (verbal report) notes 100 percent involvement of wolves in Kurskaya Oblast with trichinellae.

The second most frequently involved carnivore is the fox, in which trichinellosis has been recorded in 30 to 60 percent of the cases. In the north, trichinellosis is most often found in bears and in polar foxes. In the rest of the animals enumerated, trichinellosis has been recorded in a smaller percentage of cases but quite often. M. Ya. Belyayeva (1954, 1955), for example, in a dense Belovezhskaya forest found trichinella larvae in three species of carnivores (wolf, fox, and lynx) and also in insectivores and rodents (the yellow-throated mouse, shrew, and mole). Here, according to the author's data, the shrews and moles played the main part in the transmission of the infestation among the wild animals. Ye. G. Mashirov (1955), investigating wild animals in Tatarskaya A.S.S.R., demonstrated trichinella larvae in 23 out of 187 foxes, 4 out of 101 minks, 3 out of 15 martens, 1 out of 5 raccoons, 1 out of 13 polecats, and 1 out of 7 ermines. The author notes that the infection of wild animals occurs chiefly during the period from May through October and is accomplished through the eating of infested rodents. Yu. A. Berezantsev (1956), examining wild animals in Leningradskaya and Novgorodskaya Oblasts, found trichinellae in 10 out of 11 wolves, in 1 out of 7 foxes, in 3 out of 31 raccoons, and in 3 out of 5 lynxes. All these data undoubtedly show the existence of natural foci of trichinellosis, and make evident the fact that in wild animals trichinellosis is much more widespread and more intense than in domestic animals.

According to the data of V. P. Koryazhnova (1938, 1950), A. V. Merkusheva (1951-55), M. Ya. Belyayeva (1954, 1955), Yu. A. Berezantsev (1955, 1956), and a number of other re-

search workers, the main primary foci of trichinellosis is in nature; secondary foci, in biocoenoses associated with man.

A. V. Merkushev, analyzing his own data and those in the literature on the spread of trichinellosis among wild and domestic animals, worked out a scheme of the main routes of transmission of the infestation in "forest biocoenoses" and "biocoenoses associated with man." According to this scheme, the spread of trichinellosis among wild animals is accomplished as the result of predacity, the eating of carrion as well as the swallowing of insects and bird excrement. The last mentioned route of infection is possible because certain carcass-eating insects such as ground beetles, carrion beetles, fly larvae, and birds are, according to the author's data, reservoir hosts of trichinellae. From natural foci the infestation may be transmitted to domestic animals, and here the catch of the hunt, carrion, insects, and bird excrement serve as the transmission factors. From domestic animals, mainly hogs, the infestation is transmitted to man. Therefore, trichinellosis of man is associated with trichinellosis of wild animals.

It seems to us that in the light of the data presented, the cause of occurrence of various outbreaks of this disease becomes clear among the population in localities previously favorable with respect to human trichinellosis and trichinellosis of domestic animals. Apparently, such outbreaks are possible where trichinellosis is widespread among the wild animals and where, thanks to the occurrence of some kind of specific conditions, the transition of infestation is effected from a natural focus into a biocoenosis associated with man. These conditions may be of a chance nature, and then the spread of trichinellosis among people is limited to a single outbreak, but it can also be reinforced, and in this case the disease becomes epidemic. We believe that the character of chance epidemics and endemic cases of trichinellosis are so different that they can be separated into independent types of foci.

We call localities with an endemic spread of trichinellosis permanent stabilized foci of this disease. It may be supposed that in the first stages of formation of such foci they were associated with natural foci. In time, thanks to the presence of favorable epidemiological con-

ditions the spread of the infestation began to be realized within the human biocoenosis and the connection of these foci with the primary natural focus was lost. It is possible that in certain cases a synanthropic focus becomes associated with a natural focus but can exist independently also. Therefore, although permanent foci arose from natural foci of trichinellosis, at the present time they exist independently of them. The infestation cycle in such foci is accomplished through domestic animals, from which trichinellosis is transmitted to man. Among such stabilized foci are the United States, Germany, Byelorussian S.S.R., and certain regions of the Ukrainian S.S.R.

We call various brief outbreaks of trichinellosis temporary foci. The infestation cycle in them is accomplished with the participation of both domestic and wild animals. The domestic animals, particularly hogs, are infected from wild animals directly (by eating their carcasses, the catch of the hunt, insects) or through the medium of other domestic animals, for example, rats. In foci of the temporary type man is infested from domestic animals, chiefly from hogs. In various cases the infection may occur also from wild animals; however, this is less characteristic than infection from domestic animals. Thus, cases of brief outbreaks of human trichinellosis are known which have occurred as the result of the consumption of badger meat (M. Ye. Semenova, 1947); wild boar meat (G. M. Maruashvili, N. G. Sakvarelidze, and I. G. Matiashvili, 1955); bear meat (M. R. Zak, 1955), and others as food. Foci of the temporary type are recorded everywhere now, including various regions of the Soviet Union. However, these two types of foci do not exhaust the list of the entire variety of epidemiological characteristics of trichinellosis in various localities. An analysis of the data in the literature permits us to distinguish a third type of trichinellosis focus characteristic of regions with extensively developed hunting, thanks to which the population has a permanent direct contact with wild animals.

An example of this type of focus is the Arctic region. While previously the problem of the spread of trichinellosis in the Arctic was mainly of interest from the point of view of studying regional pathology, at the present time it is

assuming much greater importance because of the opening up of these regions and is attracting the attention of numerous research workers.

Study of this problem was begun in 1947, when word was received in the Copenhagen Institute of Sera of a large trichinellosis outbreak among the Eskimos of the eastern part of Greenland. The expedition which went to the site of the outbreak found more than 300 cases of trichinellosis among the native population, 33 of which terminated in death (Thorborg, Tulinus, and Roth, 1948). According to the data of the authors mentioned, similar outbreaks had occurred in Greenland in 1933 and in 1944 (the last outbreak included 63 persons, of whom 20 died), but had been diagnosed as ptomaine poisoning first and typhoid fever second. Both outbreaks are at the present time considered to have been trichinellosis. At the same time as this disease was found in Greenland, its presence was also suspected on the island of Southampton, and in 1948 Brown and co-authors made an immunological examination of the population of the island for trichinellosis and obtained a positive skin reaction in 91 out of 195 and a positive microprecipitation reaction in 39 out of 98 persons (Brown and others, 1949). On an island next to Southampton, Igloolik, positive immunological tests for trichinellosis were recorded in 22 (skin test) and 28 (microprecipitation test) of 100 persons examined (Brown and others, 1950).

In Canada, through the use of trichinelloscopy of the muscles of the diaphragms of cadavers from Ottawa and British Columbia, trichinellosis was found in 1.5 to 4 percent (Poole, 1953). Approximately the same percentage of involvement was shown in other regions of Canada: 1.5 percent in the population of Montreal; 1.75 percent in the population of Toronto; 4 percent in the population of Vancouver (Coffey and Wigglesworth, 1956). These authors found two cases of trichinellosis in Eskimos who had come from the Labrador Peninsula. In Alaska, trichinellosis was found among the Eskimos and Indians in 6.6 percent of the cases in Bethel and 1.6 percent in Kotzebue (Hitchcock, 1950, 1951).

After having studied the routes of entrance of the infestation into man in the Arctic, all the authors have come to the unanimous con-

clusion that hog meat does not play any part as a factor in the transmission of trichinellosis in these regions, because the native population uses it rarely as food. Various research workers have expressed the idea of the possibility of transmission of the infestation to man through the meat of sled dogs, which have a very high incidence of trichinellosis (Kuitunen-Ekbaum and Eleming, 1949; Masterton and Lewis, 1955). However, such a suggestion does not have adequate basis, because the dogs are used as food only in exceptional cases. This is explained by the fact that the meat of old dogs is too hard and tasteless; the young animals are kept for traveling and for hunting and are killed for food only during years of famine (Thorborg, Tulinius, and Roth, 1948). In the opinion of the majority of research workers engaged in the study of trichinellosis outbreaks among the Arctic population, human infection in this region is accomplished basically through wild animals.

The examination of various species of wild Arctic animals has shown that many of them are actively involved with trichinellosis. Thus, Roth (1949) found trichinella larvae in 6 out of 19 polar bears, in 6 of 101 polar foxes, and, which is particularly interesting, in 1 out of 17 seals, *Erignathus barbatus*. Rausch and co-authors (1956) found trichinellae in 22 out of 42 species of Arctic animals examined. According to the data of these authors, the greatest involvement is among grizzly, black, and polar bears, and among wolves, foxes, polar foxes, and shrews. Coffey and Wigglesworth (1956) also mention the great degree of trichinellosis infestation among polar and black bears. Kuitunen (1954) found trichinella larvae in 17 of 394 walruses caught near the island of Southampton. This author presents an unpublished report of Danish workers who found trichinella larvae in two walruses caught on the western coast of Greenland. In the opinion of the authors, all the species enumerated can transmit trichinellosis to man, since the native population of the Arctic uses all the wild animals possible as food. In a number of cases the meat of these animals is eaten raw or very slightly cooked. Recently, many research workers have been emphasizing the role of sea mammals in the transmission of the infestation to

man (Roth, 1949; Rausch and others, 1949, 1950; Hitchcock, 1950). The authors mentioned come to a similar conclusion on the basis that study of the various outbreaks of trichinellosis has permitted them to establish the coincidence of the onset of epidemics with the season of starting the hunts for sea mammals.

In addition, it has been shown in a number of cases that infection occurred after the use of walrus or seal meat as food. Thus, according to Roth's data (1949), in the cases observed by him the trichinellosis infection of two men in the region of Sukkertopen, Greenland, occurred as the result of eating raw walrus meat which had been sent from Holsteinborg—the center of an epidemic outbreak of trichinellosis. Hitchcock (1950), in his turn, notes that of the 10 patients with trichinellosis found by him, 2 persons had been infected following the consumption of raw seal meat, and 1, of whale meat. The possibility of occurrence of large epidemics of human trichinellosis from sea mammals is also confirmed by the observations of Rausch and co-authors (1949), according to whose data several persons were infected simultaneously from one walrus carcass, the meat of which had been distributed among all the inhabitants of the small village. In another inhabited place the inhabitants were infected after eating whale meat.

As far as the routes of spread of trichinellosis among the wild Arctic animals is concerned, the infestation cycle may be accomplished differently in them. The eating of dead animal carcasses is of great importance, particularly in connection with the fact that in the north they can be preserved for a long time in the environment. Predacity also plays a definite part. Certain authors indicate the possibility of transmission of the infestation through the eating of bird meat, such as crows and polar owls, which, according to their observations, are reservoir hosts of trichinellae (Abs and Schmidt, 1954). The trichinella larvae swallowed by birds after eating animal carcasses preserve their viability for a certain time in the birds' digestive tract and can then be disseminated in the environment along with host excrement. Polar foxes, bears, Eskimo dogs, and other terrestrial mammals are infected with trichinellosis by eating the birds which have

the viable trichinella larvae in their intestines as well as by eating plants or eggs from the bird nest contaminated by bird excrement. The problem of infection of sea mammals has not as yet been solved and requires further study. As one of the possible routes of infection, mention is made of the swallowing of larvae which have fallen into the water together with bird excrement.

Existing ideas concerning the role of lemmings in the transmission of infestation deserve great attention. According to Faliatarek's data (1943), lemmings periodically make great migrations, in the process of which they have to cross rivers. If the river has a rapid flow they may be brought out to sea, where they serve as the source of nutrition for mammals. A high percentage of trichinellosis of lemmings has been established by a number of authors.

The material presented shows the distinctness of the epidemiological conditions of regions in which hunting is well developed. The third type of trichinellosis focus distinguished by us on this basis is characterized, on the one hand, by its stability, similar to the focus of the first type, but, on the other hand, markedly different from it in the routes of spread of the infestation. In the focus of the third type the invasion cycle occurs among wild rather than domestic animals and specifically the wild animals serve as the transmission factors in giving man trichinellosis.

Therefore, we are proposing the distinguishing of three types of human trichinellosis foci: (a) permanent foci, in which the invasion cycle is accomplished in domestic animals and infection of man occurs from domestic animals (mainly from hogs); (b) temporary foci, in which the transmission of the infestation to man is accomplished mainly through domestic animals, less often through wild animals; (c) permanent foci, the invasion cycle in which the transmission to man is brought about through wild animals.

If these foci are analyzed in the historical aspect, the first existing type should be considered a focus in which the invasion cycle and transmission to man are accomplished through wild animals (third type of focus). Afterward, when domestic animals are included in the epidemiological chain of trichi-

nellosis, thanks to the agricultural activity of man, the remaining two types of foci occur. Of these, the second type is the earlier and characterized by the sporadic occurrence of cases, since in the first stages of the transition of the infestation from natural foci into a biocoenosis associated with man the connection between them is of a temporary nature. Gradually, an increase in infestation occurs in these biocoenoses, as a result of which its cycle is accomplished now without the participation of wild animals, and therefore a stabilized focus of human trichinellosis develops (first type of focus).

At the present time, as seen from the data in the literature presented here, all three types of human trichinellosis foci can exist in parallel, independently of one another.

It is quite obvious that the measures for combating trichinellosis cannot be the same for foci of different types. In the foci of the first type, measures for disinfecting hog meat, the main transmission factor, and the prevention of infection of hogs should be the principal ones taken. In the temporary foci the main attention should be given to eliminating the possibilities of transmission of the infestation from a natural focus to a biocoenosis associated with man. Recommendation of any kind of measures for foci of the third type is still difficult, because the spread of the infestation in them is associated directly with wild animals and depends on the characteristics of the life and occupational activity of the population.

Echinococcosis

Echinococcosis is one of the helminthozoonoses which is widespread on the territory of the Soviet Union and in many foreign countries. The economic significance of echinococcosis and also the proportion of it in human pathology causes us very pointedly to ask the question of the need for fighting decisively against this disease. Success in this work is to a considerable degree determined by the completeness of the knowledge of the epidemiology and epizootiology of echinococcosis. At the same time, a number of problems in this field have not as yet been adequately studied. Among them, first of all, is the problem of the

natural foci of echinococcosis and its part in the epidemiology of human echinococcosis.

One of the first to direct attention to the natural focalization of echinococcosis was Riley (1933, 1939), who showed the transmission of the infestation from wolves to caribous in the State of Minnesota in the United States. Rausch and Schiller (1951) in Alaska and Sweatman (1952) and Miller (1953) in Canada established the fact that wolves, coyotes, and foxes serve as the definitive hosts of echinococci, while American and Canadian deer, moose, caribous, and bisons serve as the intermediate hosts. The infection of wild carnivores is accomplished as the result of predacity; herbivora are infected by swallowing the eggs of the echinococcus which are widely disseminated in the environment by wolves and other definitive hosts. The authors emphasize the fact that domestic herbivora and dogs do not participate in this cycle. According to the observations of Wolfgang and Poole (1956), the main definitive host of echinococcus in Canada is the wolf. From wolves the disease is transmitted to wild herbivora, chiefly by the caribou, the percentage of infection of which ranges from 5 to 20 percent. Similar data were obtained for Canada by Meltzer (1956) and for Canada, Alaska, and the United States by Magath (1954). According to the material of the latter author, the invasion cycle in these countries may be accomplished along three main routes: (a) wolf—elk—wolf; (b) fox (less often, wolf or dog)—long-horned cattle, hogs—fox, wolf, dog; (c) polar fox—field mice—polar fox. Of the three possible routes mentioned by the author, the first and third characterize natural foci. Therefore, all the data presented in the literature undoubtedly show that, in addition to the usual invasion cycle carried out among domestic animals (dog—domestic herbivora—dog) and characteristic of synanthropic foci of echinococcosis, there also exist cycles among wild animals; that is, natural foci of invasion.

In a whole series of cases the natural foci may exist for a long time, without inflicting any particular economic damage and without going into a biocoenosis associated with man. Miller, for example, asserts that in a number of places of British Columbia and northern Canada,

natural foci (wolf-American and Canadian deer-wolf) have been existing for centuries without spreading to involve domestic animals and man.

For the transition of the invasion from the natural focus into a synanthropic one and for the purpose of reinforcing the latter, the existence of definite epidemiological conditions is needed for providing contact of man or dogs with wild animals. In a number of places, particularly in the Arctic, such conditions are of a permanent nature, because they depend on the characteristics of the life and work activity of the population. It is therefore completely natural that in the Arctic a considerable degree of human involvement is observed along with the extensive distribution of echinococcosis among wild animals. Thus, among the native population of Canada and Alaska, echinococcosis was found, by means of the intracutaneous Cazzoni test, in a large percentage of cases. According to Miller's data, in Indians from reservations in British Columbia positive reactions were found in 15 and doubtful reactions in 12 out of 842 persons examined. Wolfgang examined 293 Indians in 1954 in the Yukon region and found 38 percent positive reactions. In his examination of 1,145 Indians living along the Mackenzie River, he obtained a positive result in 41.5 percent of the cases. Poole in 1955 examined 584 Indians from settlements situated near Great Slave Lake and found 13.5 percent involvement (Wolfgang and Poole, 1956); Hitchcock in 1950 examined 366 Indians from Kotzebue, Alaska, and obtained a positive intracutaneous test in 3.2 percent of cases. On St. Lawrence Island a positive reaction with echinococcus antigen was obtained in 66 of 232 Eskimos examined in 1950, and in 78 of 260 examined in 1954 (Rausch and Schiller, 1956).

It should be noted that in many of the regions listed above a considerable degree of involvement of dogs was also observed. Thus, dogs from Indian settlements of British Columbia, Alberta, and the northeastern territory of Canada were infected in 28 percent of cases, according to the authors' data; dogs from settlements situated along the Mackenzie River, in 25 percent; and dogs from St. Lawrence Island, in 12 percent of cases.

The data presented graphically demonstrate

the extensive distribution of echinococcosis among the Arctic peoples and also the complete coincidence of areas of the natural foci of this disease with foci of human echinococcosis. In a whole series of cases the synanthropic foci of echinococcosis have already lost their connection with natural foci and at the present time exist entirely independently. The parallel existence of natural and synanthropic foci is also possible, whereby the invasion cycle is accomplished within each of them and by means of the passage from the natural focus into the synanthropic one, and vice versa.

An analysis of the data in the literature shows that the passage of the infestation from natural foci to man can be accomplished by three routes: directly from wild animals, through the medium of dogs, and through elements of living and nonliving nature.

The first route is observed in regions in which hunting is well developed. It is found among Indians and Eskimos of Alaska, Canada, and the St. Lawrence, Bering, and Komandorskie Islands as well as in a number of other Arctic localities. Man is infected by swallowing eggs located in the pelts of wild carnivores killed in hunting. In the removal of the hide, the eggs which stick to the fur remain on the hands of the hunter or person cutting up the carcass (among the Indians and Eskimos this work is most often done by women, which explains the greater percentage of involvement of them with echinococcus than of men), and can then enter the mouth. In addition, in shaking out the hides, which are usually tanned in the house, the eggs fall onto household objects and food products, where they may maintain their viability for a long time (Magath, 1954; Rausch and Schiller, 1956).

In the second route of passage of the infestation to man, dogs are infected directly from wild animals and then serve as the source of infection of the population. The dogs are infected when they are fed products of the hunt (for example, the entrails of deer infected with echinococcus), in the process of hunting wild rodents and other small animals (particularly often in the summer, when the dogs are not used so much for work and are fed less), and also through the eating of carcasses of wild animals which have died. In certain regions,

dogs may play the part of mechanical vectors of the infestation, since sometimes eggs from infected dogs, which was established by A. F. Nosik (1952, 1954), or from wild carnivores fall onto their fur. The latter occurs in Canada, where according to the data in the literature (Wolfgang and Poole, 1956), the population not uncommonly raise young wolves together with the dogs in order to train them. Certain authors mention the fly, *Phormia regina*, in the intestine of which the eggs maintain their viability (Schiller, 1954), as the second mechanical vector of the echinococcus eggs.

Infection of man through elements of living and nonliving nature (third route of passage of the infestation) is accomplished as the result of the eating of various plants contaminated by the excrements of wild carnivores as well as the result of drinking water from natural bodies of water which serve as watering places for wild animals (Magath, 1954; Meltzer, 1956).

Echinococcus Species

The possibility of human infection through elements of nature is the more probable since observations of a number of authors have shown that the oncospheres of the genus *Echinococcus* (*E. granulosus* and particularly *E. sibiricensis*) are very resistant to environmental influences. For example, in water at a temperature of +2° C. the eggs maintain their viability for 2 years. Low temperatures act very weakly on the eggs. The eggs may maintain their viability even after a brief temperature effect equal to -51°. The eggs which are in frozen animal carcasses remain viable for a very long time (2 years or more). Lyell found live eggs in the body of a polar fox which had been lying in the tundra under the snow for several years. The eggs can also pass the winter in ground covered with snow, despite the fact that the air temperature at this time reaches -37° to -40° (A. F. Nosik, 1951, 1952; Schiller, 1954; Lyell, 1956). The problem of the natural focalization of echinococcosis cannot be considered in isolation from the question of the species composition of the genus *Echinococcus* which has for a long time been debated in the literature.

As is known, two points of view existed among investigators on this question until re-

cently. According to one of them, which was supported by Virchow, Leuckart, Klemm, Dew, K. I. Skryabin, A. F. Nosik, and certain other authors, the unilocular and multilocular echinococci are the same zoological entity—*E. granulosus*. The proponents of the unitarian theory explain the difference in the structure of the larval forms of the echinococcus by the capacity of the maternal vesicle of budding off exogenous daughter vesicles very early under the influence of certain environmental conditions, which leads to the formation of an alveolar (multilocular) echinococcus. According to the views of the adherents of the dualistic theory, Mangold, Posselt, Romanov, N. F. Mel'nikov-Razvedenkov, Deve, the alveolar echinococcus represents an independent species—*E. alveolaris* (multilocularis), which is distinguished from *E. granulosus* not only through the character of the structure of the larva but also through certain details of the structure of the sexually mature forms. In 1950–56, Rausch and Schiller, in studying the distribution of echinococcus on the St. Lawrence, Bering, and Komandorskie Islands, isolated and described a new species of echinococcus—*E. sibiricensis* (Rausch and Schiller, 1954), characterized by an alveolar larval structure similar to the multiloculated echinococcus. The definitive hosts of this species proved to be polar foxes, foxes, and dogs; the intermediate hosts, Microtinae rodents and, facultatively, man. According to the authors' data the percentage of involvement of the polar foxes varied within limits of from 40 to 100 percent. Dogs were affected to a much smaller degree (about 12 percent). Development to sexually mature forms in the polar foxes was completed in 32–33 days, and oviposition lasted about 3 to 3½ months. The larval forms of *E. sibiricensis* parasitized rodents in the liver, producing metastases in the mesenteric lymph nodes.

The authors were able to produce an experimental infection of rodents through feeding them with echinococci obtained from spontaneously infected polar foxes. As early as the 150–170th day of infection, the liver was markedly enlarged and constituted two-thirds of the body weight. The rapid growth and alveolar forms of the parasite were brought about, in the authors' opinion, by the exogenous

growth of secondary vesicles, which is not characteristic of *E. granulosus*. According to Man-kau's (1956) data, a characteristic feature of the pathological process which developed in the rodents was perivascular mononuclear infiltration of all organs.

Simultaneously with the demonstration of the alveolar echinococcus in rodents, the considerable distribution of this parasite was shown also among the inhabitants of the St. Lawrence and Bering Islands. Hereby, the authors established the fact that the number of cases of human echinococcosis increased particularly during a period of an increase in the number of polar foxes and rodents.

It is assumed that *E. sibiricensis* has an Arctic origin and has spread mainly from the center of Europe to the East, whereby the St. Lawrence Island represents the extreme northeastern boundary of it (Rausch and Schiller, 1951, 1954, 1956; Rausch, 1954; Schiller, 1955; Lyell, 1956; Thomas and others, 1954). In summarizing the results of their 6 years of research, Rausch and Schiller have come to the conclusion that alveolar echinococcosis, which is widespread among the population of the Arctic regions of Eurasia, is produced by *E. sibiricensis* parasitization and that the previous conception of *E. granulosus* as the etiological factor of this disease is erroneous. Therefore, they consider the newly described species an independent zoological entity and recognize the existence of two echinococcus species: *E. granulosus* and *E. sibiricensis*. They identify the multiloculated echinococcus with *E. sibiricensis*.

A detailed study of the new species was carried out by Vogel (1954) in Germany. After investigating wild animals in the areas of distribution of alveolar echinococcus in man, the author found sexually mature echinococci, morphologically distinct from *E. granulosus*, in the intestines of 4 out of 11 dissected polar foxes. By feeding these parasites to 19 species of mammals, he showed the development of larvae of the alveolar type in the liver of wild rodents (*Microtus oeconomus ratticeps*, *Microtus arvalis*, *Sigmodon hispidus*). In the histological changes and the pathogenic effect, the picture resembled alveolar echinococcus of man. Infection of dogs by means of feeding them with the liver of spontaneously infected field

voles *M. arvalis* led to the development of sexually mature forms of echinococcus identical with the parasites found in the polar foxes and different from *E. granulosus* in their smaller size, different arrangement of the sexual opening, a smaller number of testes, and the absence of lateral uterine appendages. Similar specimens were isolated from dogs infested with alveolar vesicles which had been taken from man. Vogel comes to the conclusion that *E. sibiricensis* is a synonym for *E. multilocularis* (Leuckart, 1863) and should be called this according to the law of priority.

Subsequent authors engaged in the study of *E. sibiricensis* confirmed the existence of a number of morphological characteristics of the sexually mature forms of this helminth. Therefore, at the present time it has been established that *E. sibiricensis* is different from *E. granulosus* not only in the structure of the larva but also in that of the mature parasites. In addition, according to the material of all the authors, it is distinguished also by certain biological-ecological features, particularly the lack of coincidence of areas of distribution and by the parasitization of different host species. The definitive hosts of *E. granulosus* are wolves, jackals, and dogs; the intermediate hosts, domestic and wild herbivores (mainly); the definitive hosts of *E. sibiricensis* are polar foxes, foxes, dogs; the intermediate hosts, wild rodents. Therefore, there is every basis for considering *E. granulosus* and *E. sibiricensis* independent zoological species.

In the Soviet Union, no special work has been done yet in the matter of demonstrating *E. sibiricensis*. However, in 1941 V. P. Afanas'ev published a work in which he reported finding multilocular echinococcus vesicles in the livers of wild rodents on the Komandorskie Islands. At the same time, he found sexually mature echinococci in one of the dissected polar foxes. It is characteristic that the echinococci were absent from domestic animals. At the present time, certain authors report their finding of sexually mature forms of echinococcus, different from *E. granulosus* morphologically, in polar foxes and foxes. Thus, A. N. Kadenat-sii found such parasites in foxes in Omskaya Oblast (verbal report). A. M. Petrov found *E. sibiricensis* in an Azerbaijan fox and in polar

foxes in material collected by I. M. Isaychikov on Kil'din Island (verbal report). The larval stages of *E. sibiricensis* have been reported in rodents only by Yu. F. Morozov (1956) in a red mouse in Vilyuskiy Rayon of Yakutskaya A.S.S.R. and in one field vole—*M. oeconomus* in Barabinskiy Rayon of Novosibirskaya Oblast. As far as the spread of this species among the population is concerned, in the present state of our knowledge it is possible to say only that foci of alveolar echinococcus of man have been found in western Siberia, in certain regions of eastern Siberia, particularly in Yakutskaya A.S.S.R., in Tartarskaya and Bashkirskaya A.S.S.R., and in various rayons of Kazakhstan, that is, in the northeastern part of the Soviet Union.

It must be supposed that further investigations will aid in establishing more exactly the species classification of the causal organism of this infestation and will aid in deciding whether, as Rausch and Schiller suppose, the etiology of human alveolar echinococcosis is actually associated with *E. sibiricensis*. At present, this may be only assumed, based on a number of facts and primarily on the similarity of the clinical and histopathological picture of the disease in man and rodents as well as on the morphological similarity of the parasites. Thus, according to Vogel's data, the sexually mature echinococci found in dogs artificially infected with multilocular vesicles which had been taken from man were identical with *E. sibiricensis* from spontaneously infected polar foxes. Proof of the role of *E. sibiricensis* as a causal agent of alveolar echinococcosis of people is the distribution of this disease in the northeastern regions, which, as has already been noted above, is characteristic of the given species of parasite.

Acknowledging, therefore, the correctness of the Rausch and Schiller hypothesis concerning the etiological role of *E. sibiricensis* in the development of alveolar echinococcosis of man, we consider it premature as yet to identify *E. sibiricensis* completely with *E. alveolaris* as Vogel suggests. Certain data which speak against such an identification motivate us.

Among these data is the problem of the intermediate hosts of these parasites. According to material obtained by all authors, a character-

istic feature of *E. sibiricensis* is the parasitization by the larval stages only of rodents and facultatively of man. At the same time, a number of authors (K. I. Skryabin and R. S. Shul'ts, 1949; A. F. Nosik, 1953) note the possibility of the existence of the multilocular echinococcus in long-horned cattle and hogs. It is interesting that the vesicles found in the liver of the animals mentioned had a somewhat unusual structure. In connection with this, it might be supposed that the multilocular echinococcus found in domestic animals is not identical with *E. sibiricensis*, being an independent third species or else a variety of *E. granulosus*. It is certainly possible that such an assumption will not be confirmed in the future; however, for a final answer to the question of the identity of the multilocular echinococcus and *E. sibiricensis*, further observations and experimental research are needed.

Regardless of the results of this research, it is already quite obvious that in connection with the demonstration of *E. sibiricensis*, the role of natural foci of echinococcosis in the epidemiology of this disease is increasing still further, since the given species is much more widespread among wild animals than *E. granulosus*. The epidemiological importance of natural foci of *E. sibiricensis* in regions where hunting for wild carnivores and herbivorous

animals is of great importance in the economy of the population and also in regions where the population is constantly in contact with dogs is particularly great. Among such regions, North America and the Arctic should be mentioned first. Apparently, similar epidemiological conditions occur also in a number of the northern regions of the Soviet Union. The data of V. S. Seménov (1950) concerning the considerable distribution of echinococcosis and particularly of the alveolar echinococcus among the population of Yakutskaya A.S.S.R. is very symptomatic in this respect.

It is quite evident that the attention of Soviet investigators should be directed to the problem of echinococcosis devastation, whereby in developing a plan for fighting against this disease, measures directed both at the sanitization of dogs and at cutting the connections with natural foci of echinococcosis should be provided.

EDITORIAL NOTE: The author's figure for trichinellosis in the United States is an estimate of about 30 years ago projected from examinations of the diaphragms of a small part of the population. Rather than a record of this disease, the estimate was based on the presence of a few worms. There have been no satisfactory national estimates of the prevalence of subclinical infection, but it is probable that the incidence has declined since the enforcement in recent years of regulations requiring heat treatment to destroy trichina in garbage fed to hogs. All States except Alaska and Hawaii now have such regulations.

Statistical Courses in the Health Sciences

The Fourth Graduate Summer Program of Statistics in the Health Sciences will be held from June 15 to July 28, 1961, at the University of Minnesota.

Persons interested in course work in elementary or advanced statistics, vital records, records management, design of experiments, bioassay, sampling, demography, statistical aspects of nutrition research, genetics, and pharmacology, and mathematical models are invited to attend. The teaching staff will include nationally known experts.

Housing, food, and course fees will be about \$300. Stipends will be available to qualified students. For further information write to: Biostatistics, 1226 Mayo, University of Minnesota, Minneapolis 14, Minn.

Translated Readings

The following items have been culled from the CIA *Scientific Information Reports*, distributed by the Office of Technical Services, U.S. Department of Commerce. Numbers following each item refer to the issue and item, in that order. All issues are from the PB 131891 T series.

Immunization

A series of reports reviewing techniques of immunization against a variety of infections has been initiated by the *Zhurnal Mikrobiologii, Epidemiologii i Immunobiologii*, beginning with June 1960. The first includes a reference to the "needleless injector" developed in the United States (53, 78).

Oncology

I. M. Peysakhovich describes results of experiments with fluorbenzoyldiethylene triamide of phosphoric acid used to treat tumors in mice, rats, and rabbits (53, 91).

Fly Bait

An organophosphorus preparation described by V. A. Lineva and others not only is lethal to flies, effective against both imago and larvae, but also attracts the flies, apparently by its odor (53, 114).

Radiation

Tests over a 5-year period on 437 persons exposed to external radiation not exceeding 0.2 r a week, in comparison with 210 people exposed only to ordinary background radiation, indicated effects of radiation on the nervous system, it is reported by A. A. Danilin and others (53, 118).

Drug Production

Criticism of the lack of cooperation between scientists and the pharmaceutical industry is voiced by V. Timakov, Vice President of the Academy of Medical Sciences, U.S.S.R., who asserts that of 14 drugs approved by the Institute of Experimental Medicine only 2 are in production; of 16 synthesized by the Academy's

Institute of Experimental Medicine, only 3 are manufactured. He also cited a 7-year lag between the synthesis of mycerin, an antibiotic, and its general availability (53, 138).

Measles

A report by A. A. Smorodintsev and others on isolation of measles virus strains has been translated into English (53, 133).

Obstetrics

A phonoelectrocardiograph apparatus is being tested for its utility in determining the position of the fetus in the womb (53, 137).

Chronic Diseases

A diagnostic test for cancer, based on the time it takes for blood serum to discolor methylene blue, is described by N. A. Konovalova, Novocherkassk. He placed 0.2 ml. of an 0.15 percent aqueous solution of methylene blue and one ml. of blood serum in a test tube, mixed them carefully, and recorded the time required for complete discoloration with the tube in a bath of boiling water. The reaction was considered negative if discoloration occurred in 8-9 minutes, doubtful, if 9-10 minutes, and positive if more than 10 minutes were required. Results were 93 percent positive, 7 percent negative with cancer patients; positive in 85 percent, negative in 10 percent, and doubtful in 5 percent of patients suspected of having malignant neoplasms; and 14.8 percent positive, 73.6 percent negative, and 11.6 doubtful in presumably healthy patients. The total tested was 92 (32, 101).

L. Lariionov, Moscow, discusses cancer chemotherapy (45, 111).

Hormonal treatment of prostate cancer is described as having advantageous results by N. I. Shapiro and V. I. Rozhdestvenskiy, Leningrad-Moscow (32, 94).

A relatively high incidence of cancer mortality among workers employed in processing smoked foods is reported by B. D. Kaufman et al., Moscow-Leningrad (36, 61).

Methods of preparing smoked fish, which affect concentrations and distribution of 3,4-benzpyrene are detailed by N. D. Gorlova et al., of Moscow and Leningrad (45, 110).

Carcinogenesis

Special measures have been ordered for the safe handling of dichlorobenzidine, dicyclohexamine, 2-acetylaminofluorine, and other chemicals, as a result of a study which concludes that carcinogenicity is linked with molecular structure. The chemicals studied were divided into substances acting locally, those which are resorptive and selective, and which may act at a location remote from the point of application, and those which may produce tumors at several parts of the organism, it is reported by L. M. Shabad, Moscow (47, 112).

The absence of riboflavin as one of the diagnostic indicators of the presence of a malignant tumor is suggested by Ya. A. Kagan, Vitebsk (47, 113).

Homeopathy

Members of the U.S.S.R. Academy of Medical Sciences, in a letter to *Izvestia*, have denounced the trend to homeopathic medicine in the Soviet Union. Homeopathy has been officially recognized in the U.S.S.R.; homeopaths have their own clinics and dispensaries, and it has been proposed that municipal clinics and staffs be linked with homeopathic facilities and personnel. The Academicians say that homeopathy has no scientific basis and its practitioners no scientific training. They criticize the Ministry of Health for permitting physicians, trained at public expense, to turn to homeopathy, frequently out of mercenary considerations. The popularity of homeopathy with the patients is ascribed by the writers to shortcomings of other medical services available. To equate medicine with homeopathy, they conclude, is to equate astronomy with astrology (47, 148).

Intoxicating Honey

An unspecified number of intoxications, marked by asthenia, headaches, dizziness, nausea, vomiting, motor disorder, and spasms of hands and feet, were linked to honey gathered in the Khabarovsk area, where late springs

led the bees mainly to seek bryophyta, heather, and wild rosemary. The nectar of these plants contains poisons, it is reported by V. M. Baumman and V. Sh. Shatayev (48, 100).

Water Pollution

To determine the presence of cyanides in waste waters of coke-chemical plants and gas-generating stations, F. G. Detlovitskaya proposes that the cyanides be distilled from a weak acid medium in the presence of lead nitrate, and converted into thiosulfides by heating in a solution of sodium tetrathionate in an alkaline medium. Colorimetric determination is said to be sensitive to 0.5 mg. of CN per liter, with a margin of error of 2-6 percent (48, 109).

Cybernetics

A scientific council on cybernetics has been organized within the Academy of Medical Sciences, U.S.S.R., with biological and medical sections, to deal with problems of diagnosis, therapy, prophylaxis, and public health organization. Cybernetic methods are expected to improve statistical measures of morbidity and to facilitate evaluation of preventive measures and therapy. A report by V. Parin and D. Menitskiy describes apparatus now employed to utilize cybernetic techniques and future plans (48, 119).

Aseptic Technique

On the basis of experiments with the colloidal properties of bacterial aerosols, employing *Staphylococcus albicans*, V. V. Vlodavets, Moscow, recommends use of a four-layer gauze mask, rather than a two-layer mask, by medical personnel. A 3-5 mm. layer of cotton inserted evenly in the gauze is recommended for situations requiring special caution, such as neuro-surgical or long, cavitary operations. The use of a wire frame for the masks is proposed to facilitate breathing (49, 71).

Brucellosis

A cutaneous method of inoculation against brucellosis was recommended at an All-Union Conference for "widespread introduction into medical practice." The method was developed at the Institute of Regional Pathology, Academy of Sciences, Kazakh S.S.R. (49, 74).

Federal Publications

Tuberculosis Beds in Hospitals and Sanatoria, April 1, 1959. *PHS Publication No. 801; by Stanley Glaser and Sara B. Pearson; 43 pages; 35 cents.* Provides information on the nationwide status of hospital beds set aside for tuberculosis patients. Presents data on tuberculosis beds as of April 1, 1959, and shows some adjustments made to the change in need for these facilities since 1954.

Reported Tuberculosis Data. *PHS Publication No. 638; 1960; by Lawrence W. Shaw and Arthur W. Wyman; 50 pages.* Summarizes trends in tuberculosis morbidity, mortality, and X-ray casefinding for the period 1953 through 1958. Compares the extent of the tuberculosis problem in various geographic areas and population groups.

Mental Health Motion Pictures. A selective guide. *PHS Publication No. 218; revised 1960; 98 pages; 35 cents.*

Three hundred and seventy-five films which are being used in mental health programs are listed alphabetically.

Information given for each film includes producer, principal distributor, year produced, suggested audience, and a short description of the content. Addresses of film distributors and agencies designated as State mental health authorities are also given.

A subject index groups the films in 19 categories.

Health Statistics From the U.S. National Health Survey. Cooperation in health examination surveys. *PHS Publication No. 584-D2; 1960; 38 pages; 35 cents.*

The problem of persuading people to cooperate in a health examination survey was investigated in 1958 through use of two supplemental questions in connection with the regular health interview questionnaire of the U.S. National Health Survey. The sample, representative

of the civilian noninstitutional population of the United States, consisted of about 5,000 households comprising 11,000 adults.

Patients in Mental Institutions. Part II: Public hospitals for the mentally ill. *PHS Publication No. 781; 1960; 72 pages.* Provides basic data on numbers and characteristics of hospitalized mental patients, movement of patient population, and certain administrative data.

A Preliminary Directory of Medical Groups in the United States, 1959. *PHS Publication No. 817; 1961; by S. David Pomrinse and Marcus S. Goldstein; 246 pages.*

A questionnaire to all known groups or possible groups has provided data on 1,154 multispecialty groups and 392 single specialty groups of three or more full-time physicians. The directory gives name and location of the group, date of organization, number of physicians and dentists (if any of the latter), names of medical director and clinic manager, and type of specialty if a single specialty group.

The information should be of use to medical care plans, public health departments or agencies, and physicians interested in joining medical groups in particular, as well as the medical profession in general.

So You're Going Abroad. Health hints for travelers. *PHS Publication No. 748A; 1960; leaflet; 5 cents, \$3.75 per 100.* General information on how to guard against disease. Specific information on vaccination for various areas given in:

HEALTH INFORMATION FOR TRAVEL IN EUROPE. *PHS Publication No. 748; 1960; leaflet; 5 cents, \$3.75 per 100.*

HEALTH INFORMATION FOR TRAVEL IN MEXICO, CENTRAL AND SOUTH AMERICA, AND THE CARIBBEAN. *PHS Publication No. 748B; 1960; leaflet; 5 cents, \$3.75 per 100.*

HEALTH INFORMATION FOR TRAVEL IN ASIA, INCLUDING JAPAN, INDONESIA, THE PHILIPPINES, AUSTRALIA, AND NEW ZEALAND. *PHS Publication No. 748C; 1960; leaflet; 5 cents, \$3.75 per 100.*

HEALTH INFORMATION FOR TRAVEL IN AFRICA, INCLUDING MADAGASCAR REPUBLIC AND NEIGHBORING ISLANDS. *PHS Publication No. 748D; 1960; leaflet; 5 cents, \$3.75 per 100.*

Gonococcus. Procedures for isolation and identification. *PHS Publication No. 499; revised 1960; 35 pages.*

Techniques described are those which have been most practicable and reliable. Descriptions cover successive operations, from obtaining the specimen to final identification of *Neisseria gonorrhoea* by isolation and biochemical procedures and by the rapid fluorescent antibody method.

Also included is a previously unpublished standard procedure for determining penicillin sensitivity of gonococci.

Annual Report, U.S. Department of Health, Education, and Welfare. *HEW Publication (unnumbered); 1960; 314 pages; \$1.* Report of each operating agency's activities during fiscal year 1960.

This section carries announcements of new publications prepared by the Public Health Service and of selected publications prepared with Federal support.

Unless otherwise indicated, publications for which prices are quoted are for sale by the Superintendent of Documents, U.S. Government Printing Office, Washington 25, D.C. Orders should be accompanied by cash, check, or money order and should fully identify the publication. Public Health Service publications which do not carry price quotations, as well as single sample copies of those for which prices are shown, can be obtained without charge from the Public Inquiries Branch, Office of Information, Public Health Service, Washington 25, D.C.

The Public Health Service does not supply publications other than its own.

1910

ECHO from Public Health Reports

THE FIELD INVESTIGATION OF EPIDEMIC POLIOMYELITIS (WHAT THE HEALTH OFFICER CAN DO TOWARD SOLVING A NATIONAL PROBLEM).

By W. H. Frost, Passed Assistant Surgeon, United States Public Health and Marine-Hospital Service.

PREVALENCE AND SERIOUSNESS.

Epidemic poliomyelitis, which has for many years been recognized at intervals in circumscribed localities as a serious problem for the guardians of the public health, has in the present year become in the United States one of our national public health problems. It has become so chiefly by reason of its enormously increased prevalence—an increase both in the total number of persons affected and in the area of epidemic prevalence.

Lovett (1),^b in a compilation prepared for the Massachusetts state board of health, gives the number of cases of poliomyelitis reported in the literature of the world as occurring in epidemics by five-year periods from 1880 to 1909, as follows:

Five-year period.	Cases.	Epi-demics.	Average number of cases.
1880-1884	23	2	11.5
1885-1889	93	7	13.0
1890-1894	151	4	38.0
1895-1899	345	23	15.0
1900-1904	349	9	39.0
1905-1909	8,064	25	322.0

NOVEMBER 18, 1910, pp. 1663-1676

Monthly reporting of poliomyelitis incidence was first requested in September 1910. Two months later, Dr. W. H. Frost pointed to the need for intensive field investigation by the local health officer "to provide his share of the facts which shall explain the spread of

epidemic poliomyelitis." He predicted small chance for brilliant discovery, except, perhaps, by "one or a very few of the many" whose work would be required to solve "a problem that has already become very serious and shows no indication of becoming less so."

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